STORMWATER MANAGEMENT & DESIGN
Chace Road Solar Farm
(Map 241, Lot 36)
67 Chace Road
Freetown, MA

Applicant: TJA Clean Energy
Alan Alves, Manager
150 John Vertente Boulevard
New Bedford, MA 02745

Project No. 0626-007A

February 2022

DRAINAGE NARRATIVE
TO ACCOMPANY SITE PLAN APPLICATION OF
ALAN ALVES - MANAGER, TJA CLEAN ENERGY, LLC
67 CHACE ROAD (MAP 241, LOT 36)
FREETOWN, MA

Located on a portion of a one hundred fifty (148+) acre site, the proposed project involves the development of a solar farm for harnessing, converting, and distributing electric energy through the existing power grid/network. The project area is identified as Lot 36 on the Freetown Assessors' Map sheet 241.

At present, the site is predominantly comprised of a mix of wooded uplands, open pit sand and gravel mining operations, active cranberry growing bogs, and wetland resource areas. The wetland resource areas include: bordering vegetated wetlands (BVW), cranberry bogs, surface water bodies, Fall Brook and several unnamed perennial streams. The site is located within the General Use District. Residential land uses, cattle raising, commercial/industrial land uses, a railroad line, and undeveloped wooded lots, abut the site. Two solar farms covering approximately 17.5 acres are currently located along the eastern portion of the parcel. Two unpaved cart paths currently serve as access from Chace Road to the site. Cart path 'A' intersects Chace Road approximately 350 feet easterly of the western site boundary and runs southerly approximately 5,650 feet to the southern lot boundary where it continues onto additional cranberry bogs located on Assessors Map 252, Lot 1. Cart path 'B' is located approximately 360 feet easterly of Cart path 'A' and serves as access to the existing barn, trailer, and existing solar installations along the eastern part of the site. Cart path 'C' branches off Cart path 'A' approximately 950 feet southerly of Chace Road and supports access to the existing gravel mining operations. Cart Path 'D' branches off Cart path 'A' approximately 5,125 feet southerly of Chace Road and serves as a secondary means of access to the cranberry bogs located on Assessors Map 252, Lot 1. Topographically, the site can be characterized as gently sloping or level terrain where the terrain historically had been altered in conjunction with cranberry bog development. The gravel operations have resulted in steeper slopes along portions of the western edges of the lot. The southern portion of the lot can be

characterized by a more variable and undulating terrain, but does contain areas of gentle slopes.

The proposed solar farm is to be located within two separate upland portions of the site and are named Array G2 and Array G3. The previous project layout included Arrays G1, G2, G3 North, and G3 South. In the project's current configuration, Arrays G1 and G3 North have been removed in their entirety from the project and Arrays G2 and G3 South (now condensed to G3) have undergone significant reductions in aerial extent.

The electrical interconnection of the PV Arrays will be accomplished via a combination of above ground electrical wiring attached to wooden utility poles and underground electrical conduits. Underground electrical lines will be installed solely within the footprint of the array areas to connect the individual solar panel table units to their respective transformers and inverters. Above ground wiring will be utilized along all other routes of the electrical interconnection between Chace Road and Arrays G2 and G3 and specifically will run along Cart Path 'A'.

The Town of Freetown encourages a 25 foot no activity setback from wetland resources areas. The majority of site activities including the installation of the solar panels and regrading of the subsoil will be located at least twenty five (25) feet from the BVW. The plan sheets outline the 25, 50, and 100 foot setbacks from the wetland resource areas at those locations that directly impact the proposed project. In general, only the proposed tree clearing, and occasional sections of the perimeter security fencing are located up to the 25 foot wetlands setback. A few exceptions to the foregoing are described below and arise due to the shape and topography of the land.

Cart paths 'A' and 'C' which currently serves as primary access within the site are generally elevated several feet above the surrounding areas. Cart path 'A' is located adjacent to resource areas such as Fall Brook, bordering vegetated wetland areas, and cranberry bogs for the majority of its length. Cart path 'C' crosses Fall Brook in the northern portion of the site and provides access to proposed Array G2. Along portions of its route, it runs

adjacent to the western bank of Fall Brook and crosses an unnamed stream and its bordering vegetated wetlands. Cart path 'D' runs along a watercourse associated with Fall Brook. The width of the cart paths vary across the site but are typically measured to be between 16 feet and 24 feet wide and contain a commonly traveled path width of 12-18 feet wide. Installation of the electrical interconnection lines on utility poles and access of construction vehicles to Arrays G2 and G3 are only possible along Cart path 'A' and Cart Path 'C' and therefore by necessity must be within 25 feet of resource areas.

The installation of the interconnection electrical wiring between Array G2 and Cart path 'A' is proposed to cross Fall Brook as shown on the site plan along a section of Fall River where existing vegetation averages only 6-12 feet in height to reduce the need for tree trimming along the banks of Fall Brook and along Cart path 'C'. The resource area flagging along Cart path 'C' come to within approximately 16 feet of each other at the narrowest point and therefore additional tree trimming would have been required to route the interconnection lines along Cart path 'C'. Due to the limited height of the existing trees that abut the western banks of the brook and the presence of grass surfaces along the eastern bank in this section, tree trimming is not anticipated for the installation or within the design life of the project. This alternative removes all wiring installation and tree trimming along Cart path 'C' and only access to the G2 Array will occur along the narrow 315 foot long section of Cart path 'C' within 25 feet of the resource areas.

The riverfront area on the site is extensive and contains in excess of 54.6 acres attributed solely to the flagged portions of Fall Brook. The riverfront area is demarcated as a parallel offset line 200 foot distant from the mean annual flood line of Fall Brook determined by the bank flagging placed by Wetlands Scientist-Botanist Kenneth Thomson. The locations of the flagging were confirmed by Wetland Scientist Brook Monroe under a separate ANRAD filing reviewed by Environmental Partners Group Inc. Portions of the work proposed within the riverfront area on site are limited to those previous discussed regarding site access, utility pole installation, and ancillary activities such as erosion control measure installation. In general, a

200- foot undisturbed buffer from the riverbank is provided for each panel array and ancillary features. Exceptions to the foregoing are described below.

The installation of approximately 5,450 linear feet of overhead electrical interconnection lines on utility poles is proposed within the riverfront area between Array G3 and Chace Road. Erosion control barriers in the form of staked silt fence will be installed along both sides of Cart Path 'A' for approximately 5,500 linear feet and along both sides of Cart path 'C' for approximately 1550 linear feet. These barriers will serve as the limit of project work. Portions of Cart paths 'A' and 'C' require minor repairs to fill in low spots where puddles form and to remove humps typically located on the lee sides of puddles. Following these repairs, a 6-inch layer of dense graded gravel be placed over a 16 foot width of Cart paths 'A' and 'C' for their entire project length to stabilize the road surface for construction traffic. Any roadway stabilization or regrading that occurs within the limits of the FEMA flood zone as delineated on the plan, shall be undertaken such that the final grade is equal to that of the existing grade in order to produce no adverse effects to the floodplain. This will include the removal of 6-inches of existing cart path soil (within the 16-foot width of stabilization) and replacement with 6-inches of dense graded gravel material to maintain existing grade. Soils scarified from the cart paths will be reused for grading within the array areas as needed. Disturbance of the soils is considered to be de minimis for the utility pole installation auguring activities along this corridor and will occur within the confines of the erosion control barrier system along the cart paths. The erosion control barriers are to be placed two feet horizontally offset away from the 16-foot gravel roadway so that the limit of work is confined to a 20-foot width along the Cart Path 'A' corridor. The utility poles will be located within the two foot offset.

Since the project work within the Riverfront Area occurs entirely within the confines of the erosion control barrier systems installed along the existing cart paths 'A' and 'C', the total work area within the riverfront area is calculated by using the average width separating the erosion control barriers along Cart paths 'A' and 'C' (20 feet) multiplied by the combined length of the cart paths (7,000 feet). This results in approximately 3.2 acres of area

which is (3.2/54.6) or approximately 5.9% of the delineated 54.6 acre riverfront area on site. The eastern bank of Fall Brook is grass covered and the western edge of the cart path features a mix of brush and small tree typically 4-25 feet tall. Therefore, actual new disturbance of the riverfront area associated with vegetation trimming or clearing work for the installation of the erosion control barriers is extremely minimal.

Tree clearing and stump grubbing is not required for the installation of Array G2, since this area has previously been stripped of vegetation and soils due to historic sand and gravel mining operations. Tree clearing and stump grubbing is required to install Array G3. The extent of the required tree clearing is shown on the site plan and clearing is intended to go up to the 25 foot resource area buffer (where site activities approach the resource areas). Due to the vast nature of the site, the closest tree clearing activities associated with the PV array installation will be approximately 1100 feet distant from the nearest occupied structure on abutting lands. Therefore, a natural vegetated buffer between the site and abutting houses will be maintained with the existing vegetation on the abutting lands. No night lighting is proposed as part of the project.

Perimeter gravel facility access roads constructed of dense graded gravel will be installed around Arrays G2 and G3 for maintenance and facility monitoring vehicle access and parking as shown on the plan. These 10 foot wide facility access roads will be installed within the limits of the 7-foot tall perimeter security fence and can be accessed only by authorized personnel through locked gates. The perimeter fence shall have a gap of 6-inches beneath the fencing to allow for the passage of small animals beneath the fencing. Signage consistent with the Town of Freetown by-law identifying the owner of the facility and a 24-hour contact number shall be provided at each panel array access gate and locations of such are shown on the plan. No pavement (*bituminous concrete*) or concrete material will be used for access road construction.

There are no potential shading issues due to man made structures on the property. However, shading due to the proposed tree clearing line is expected to seasonally affect only a small portion of the solar panels along

the western edge of Array G2. Due to the presence of previously cleared lands on abutting property shown as Map 241, Lot 41, once clearing has been conducted in Array G3, no shading issues will be anticipated for Array G3. Potential shading areas are shown on the site development plan based upon a 48 degree angle of incidence at solar noon on the day of the spring/fall equinox and a 65 foot tree height which results in a 58-foot equinox shading offset.

In order to control and obviate erosion sediment transport and migration into the BVW during construction, a row of erosion control silt fence and/or rolls of hay bales or wattles sacks shall be placed and maintained along the limits of site work throughout the construction period and until final stabilization of disturbed surfaces has been achieved and until the Freetown Conservation Commission (FCC) issues a certificate of compliance for the site development. The erosion control measures in general are intended to be placed along the 25 foot resource area buffer zone where site activities approach resource areas.

The insitu soils were classified using the soils data as gleaned from the Natural Resource Conservation Service (NRCS) map unit for the locus. According to the NRCS map units for the locus, the insitu soils within all solar arrays across the site are predominantly composed of loamy sands with varying amounts of gravel and stones. The hydrologic soil group for soils underlying each proposed array is hydrologic soil group A. NRCS classifies soils in hydrologic groups, which measure runoff potential: soils that are classified as hydrologic group A soils are soils that are well drained, exhibiting high permeability value; soils that are classified as hydrologic group D soils are soils that are poorly drained, exhibiting very low permeability value.

On December 17-18, 2020 and December 21, 2020, the engineering representative of the applicant, Mr. Andrew Sargent, EIT, MA Soil evaluator, conducted soil evaluation and analysis at representative locations at the site within the proposed panel arrays. A total of twenty two (22) soil evaluation/observation pits were excavated within Arrays G1, G2, and G3.

The locations of the observation pits and the elevation of high groundwater as determined by redoximorphic features are shown on the accompanying site plan and the soil logs are appended to the end of this narrative. The insitu soils data documented at the site in December, 2020, largely corroborate the soils data as gleaned from the Natural Resource Conservation Service (NRCS) map unit for the locus. According to the NRCS map units for the locus, the insitu soils within PV Arrays are loamy sands. Observed soils within the tested locations were generally very consistent across the site and predominantly were loamy-clean fine to medium sands. Occasional test locations revealed soils containing very fine loamy sands, however the predominant soils to be found on site can be expected to be clean fine to medium sands. **The average hydrologic soil group for the site is confirmed to be 'A'.**

DEP stormwater management guidelines and standards require that post development rates of runoff be maintained at existing rates upon completion of a project under the 2, 10, and 100 year storm events; require treatment of runoff from paved areas prior to discharge; require recharge of runoff based on soil type.

While the current DEP stormwater policy requires solar panels to be treated as impervious areas for the purposes of groundwater recharge computations, it does not require incorporation of water quality treatment Best Management Practices (BMPs) into the design and management of stormwater at solar sites because solar panels are constructed of glass, and glass surfaces do not engender any runoff borne pollutants as would be expected from bituminous concrete surfaces. Therefore, no water treatment BMPs are proposed. In terms of rate of runoff control, the grass surfaces along the drip edges of the panels will intercept and infiltrate/recharge runoff from the panels. It should be remembered that the panels are elevated above the ground so that the impervious surface is not making any contact with the ground, as such, the existing ground surface will continue to have the same runoff potential. However, in order to account for the increased volume of runoff that would be engendered by the solar panel table support posts, the impervious area in the stormwater modeling includes analysis of the impervious 4-inch diameter support posts.

Re-grading associated with the project will be minimized in order to maintain the natural flow of stormwater runoff towards the pre development wetland resource areas as much as practical. Each proposed PV array features grading designed to retain all of the precipitation that falls within the footprint of the developed area. This is accomplished by either grading the site towards spacious depressions between 6 and 12 inches in depth with very high infiltration rates within the footprint of the array or by constructing 2-3 foot wide earthen berms of 6-12 inch height around portions of the perimeter of the proposed PV arrays. This design provides complete stormwater impoundment and infiltration of the stormwater occurs entirely within the footprint of the disturbed areas. Note that the depressions shown on the watershed plans are not the only locations where infiltration of stormwater will occur, since infiltration of stormwater will also occur across all portions of the PV arrays into the highly pervious soils. The depressed graded areas shown on the plan outlined in blue highlight the areas used in the stormwater modeling to demonstrate that the footprint of the proposed arrays can fully absorb the stormwater flows and volumes. Soil infiltration rates taken from the Rawls Table in the Massachusetts Stormwater Handbook indicate that sandy soils such as those found onsite have infiltration rates between 2.41 and 8.27 inches per hour. A conservative value of 2.41 inches per hour was utilized for all stormwater calculations and it will be demonstrated that even with this conservatism, all stormwater is infiltrated rapidly into the soils.

A computer modeling software, HydroCad Stormwater Modeling System Version 10.00 developed by HydroCad Software Solutions LLC of Chocorua, New Hampshire was employed in the analyses to aid in the development of the runoff curve numbers; times of concentration; and the routing hydrographs for the sub-catchments. Under the post development conditions, stormwater runoff from the sub-catchments are captured within the perimeter of the arrays and are routed to the spacious shallow depression area(s). Precipitation was modeled using the higher and more conservative Cornell precipitation estimates rather than those required by the MassDEP stormwater management standards.

In general, the stormwater management standards require a comparison is made between the routed hydrograph for discharge rates and volumes in the existing conditions state to the post development state. The rationale for this comparison is to document that the proposed site conditions do not cause stormwater to shed from the site in such a manner as to overwhelm downstream areas with flooding and additionally to promote recharge of existing groundwater levels at the site. Note that in the pre-developed condition, any rainfall excess would directly run off to the perimeter wetlands and that in the post development condition, any rainfall excess runs off to the low points within the arrays and is infiltrated solely within the limits of disturbance. It follows that even if flow rates and volumes to the infiltration areas were to be higher in the post condition state as compared to the pre-condition state due to the changes in ground coverage, they never actually leave the infiltration areas and the goals of the stormwater management standards have been satisfied. The results tabulated in Tables 1 and 2 are shown below.

Table 1
PRE- AND POST-DEVELOPMENT PEAK DISCHARGE RATES

Design Point	Pre-Development(cfs)			Post-Development(cfs)*		
	Design Storm			Design Storm		
	2-Year	10-Year	100-Year	2-Year	10-Year	100-Year
ARRAY G1	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**
ARRAY G2	**3.53**	**7.34**	**17.12**	**0.00**	**0.00**	**0.00**
ARRAY G3	**0.00**	**0.02**	**1.58**	**0.00**	**0.00**	**0.00**

*** This represents the primary flow rate from each basin as indicated in the HydroCAD model. See the explanation in the subsequent paragraph regarding the derivation of the primary flow. Recall that all stormwater is infiltrated within the footprint of the modeled subcatchments and does not discharge off site or out of the subcatchment.**

Table 2

PRE- AND POST-DEVELOPMENT VOLUMES OF RUNOFF

Design Point	Pre-Development(af)			Post-Development(af)**		
	Design Storm			Design Storm		
	2-Year	10-Year	100-Year	2-Year	10-Year	100-Year
ARRAY G1	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**
ARRAY G2	**0.265**	**0.534**	**1.251**	**0.00**	**0.00**	**0.00**
ARRAY G3	**0.00**	**0.015**	**0.281**	**0.00**	**0.00**	**0.00**

**** Recall that all stormwater is infiltrated within the footprint of the modeled subcatchments and does not discharge off site or out of the subcatchment.**

A hypothetical horizontal orifice is included within the stormwater modeling as the primary outflow from each modeled basin and is placed 0.01 feet immediately below the highest point of the modeled stormwater detention facility. The orifice is theoretically used to demonstrate that during all modeled storm events, in no scenario will water rise up to the horizontal plane of the theoretical orifice which demonstrates flows never pass through the orifice and depart the modeled stormwater storage areas. As expected, due to the highly permeable soils, the stormwater modeling indicates that the maximum depth of the impounded stormwater within each basin is seldom greater than ½" to 1-½" for the 100 year storm event. In general, the entire volume of stormwater runoff infiltrates very quickly into the soil and is drained within a short period of time. This high permeability of the sandy soils also allows the infiltrated stormwater to rapidly recharge the adjacent wetlands, rivers, and ponds. It also should be noted that the massive site is covered by vast areas of wetlands, cranberry bogs, surface water bodies, and river courses due to its low position within a depressed north-south oriented valley that receive the majority the flows from the east, west and south. These extensive water features provide a natural buffer to water level changes with their tremendous water storage capabilities. Notwithstanding this large hydraulic buffering capacity, the stormwater management for the proposed PV arrays is designed to reduce post condition runoff rates and volumes off site as compared to the pre condition state, by locally containing and infiltrating the runoff. The end result is that there will be no direct stormwater discharges to any resource areas and the project will not have any adverse effect to adjacent and/or downstream properties.

Lower post development flow rates and volumes within Array areas G2 can additionally be attributed to the improvement of ground conditions in the post developed state as compared with the existing state. In the post developed state, a good grass condition is to be expected and is assigned a curve number of 39 in its soil class whereas in the pre developed state, area G2 contains soil that is generally devoid of vegetation which are assigned a curve number of 77 for the same soil class.

To the extent applicable, a DEP stormwater checklist has been prepared for the project and it is attached herewith, along with NRCS soils map and classification for the locus.

Test Pit Logs 1-22 December 2020
(67 Chace Road Freetown, MA)

TP-1

DEPTH	HORIZON	SOIL CLASS	COLOR	COMMENT
0-10"	Ap& Bw	SANDY LOAM	10YR 3/2 10YR5/6	
10-72"	C1	F-C SAND	2.5Y 5/4	30% GRAVEL MOTTLES@ 60" WEEPING @66"

GROUND SURFACE ELEVATION = 92.66'
HIGH GROUNDWATER ELEVATION =87.66'

TP-2

DEPTH	HORIZON	SOIL CLASS	COLOR	COMMENT
0-72"	C1	LOAMY SAND	2.5Y 5/4	10% BOULDERS/COBBLES MOTTLES@ 57" WEEPING @64"

GROUND SURFACE ELEVATION = 92.73'
HIGH GROUNDWATER ELEVATION =88.01'

TP-3

DEPTH	HORIZON	SOIL CLASS	COLOR	COMMENT
0-90"	C1	SANDY LOAM	2.5Y 5/4	MOTTLES@57" WEEPING @85"

GROUND SURFACE ELEVATION = 92.78'
HIGH GROUNDWATER ELEVATION =88.02'

TP-4

DEPTH	HORIZON	SOIL CLASS	COLOR	COMMENT
0-58"	C1	F-C SAND	2.5Y 5/4	
58-84"	C2	FINE LOAMY SAND	2.5Y 4/3	MOTTLES@ 63" WEEPING @ 64"

GROUND SURFACE ELEVATION = 94.69'
HIGH GROUNDWATER ELEVATION =89.45'

TP-5

DEPTH	HORIZON	SOIL CLASS	COLOR	COMMENT
0-72"	C1	F-C SAND	2.5Y 5/4	10% GRAVEL MOTTLES@47" WEEPING@ 56

GROUND SURFACE ELEVATION = 91.87'
HIGH GROUNDWATER ELEVATION =87.94'

TP-6

DEPTH	HORIZON	SOIL CLASS	COLOR	COMMENT
0-60"	C1	F-M SAND	2.5Y 5/4	MOTTLES@ 33" WEEPING@ 34"

GROUND SURFACE ELEVATION = 90.55'
HIGH GROUNDWATER ELEVATION =87.76'

TP-7

DEPTH	HORIZON	SOIL CLASS	COLOR	COMMENT
0-60"	C1	M SAND	2.5Y 5/4	MOTTLES@ 36" WEEPING@ 38"

GROUND SURFACE ELEVATION = 90.18'
HIGH GROUNDWATER ELEVATION =87.18'

TP-8

DEPTH	HORIZON	SOIL CLASS	COLOR	COMMENT
0-64"	C1	F-M SAND	2.5Y 5/4	MOTTLES@ 40" WEEPING@ 41"

GROUND SURFACE ELEVATION = 90.01'
HIGH GROUNDWATER ELEVATION =86.68'

TP-9

DEPTH	HORIZON	SOIL CLASS	COLOR	COMMENT
0-78"	C1	LOAMY SAND	2.5Y 5/4	MOTTLES@ 39" WEEPING@ 44"

GROUND SURFACE ELEVATION = 90.01'
HIGH GROUNDWATER ELEVATION =87.33'

TP-10

DEPTH	HORIZON	SOIL CLASS	COLOR	COMMENT
0-72"	C1	F-M SAND	2.5Y 5/4	MOTTLES@ 38" WEEPING@ 41"

GROUND SURFACE ELEVATION = 89.78'
HIGH GROUNDWATER ELEVATION =87.33'

TP-11

DEPTH	HORIZON	SOIL CLASS	COLOR	COMMENT
0-24"	Ap &Bw	LOAMY SAND	10YR3/2 10YR5/6	
24-135"	C1	M- SAND	2.5Y 5/4	MOTTLES@ 102" WEEPING @ 108"

GROUND SURFACE ELEVATION = 97.03'
HIGH GROUNDWATER ELEVATION =88.53'

TP-12

DEPTH	HORIZON	SOIL CLASS	COLOR	COMMENT
0-22"	Ap &Bw	LOAMY SAND	10YR3/2 10YR5/6	
22-135"	C1	M- SAND	2.5Y 5/4	MOTTLES@ 118" WEEPING @ 128"

GROUND SURFACE ELEVATION = 98.67'
HIGH GROUNDWATER ELEVATION =88.85'

TP-13

DEPTH	HORIZON	SOIL CLASS	COLOR	COMMENT
0-28"	Ap &Bw	LOAMY SAND	10YR3/2 10YR5/6	
28-72"	C1	M- SAND	2.5Y 5/4	MOTTLES@ 37" WEEPING @ 40"

GROUND SURFACE ELEVATION = 92.01'
HIGH GROUNDWATER ELEVATION =88.93'

TP-14

DEPTH	HORIZON	SOIL CLASS	COLOR	COMMENT
0-30"	Ap &Bw	LOAMY SAND	10YR3/2 10YR5/6	
30-120"	C1	F-M SAND	2.5Y 5/4	MOTTLES@ 100" WEEPING @ 110"

GROUND SURFACE ELEVATION = 96.62'
HIGH GROUNDWATER ELEVATION =88.29'

TP-15

DEPTH	HORIZON	SOIL CLASS	COLOR	COMMENT
0-30"	Ap &Bw	FINE LOAMY SAND	2.5Y 6/3 10YR5/6	
30-72"	C1	F-C SAND	2.5Y 6/1	MOTTLES@ 28" WEEPING @ 56"

GROUND SURFACE ELEVATION = 89.91'
HIGH GROUNDWATER ELEVATION =87.55'

TP-16

DEPTH	HORIZON	SOIL CLASS	COLOR	COMMENT
0-64"	C1	F-C SAND	2.5Y 6/1	MOTTLES@ 41" WEEPING@ 50"

GROUND SURFACE ELEVATION = 90.48'
HIGH GROUNDWATER ELEVATION =87.07'

TP-17

DEPTH	HORIZON	SOIL CLASS	COLOR	COMMENT
0-72"	C1	F-C SAND	2.5Y 6/1	MOTTLES@ 11" WEEPING@ 23"

GROUND SURFACE ELEVATION = 88.62'
HIGH GROUNDWATER ELEVATION =87.70'

TP-18

DEPTH	HORIZON	SOIL CLASS	COLOR	COMMENT
0-14"	Ap &Bw	FINE LOAMY SAND	2.5Y 6/3 10YR5/6	
14-108"	C1	M SAND	2.5Y 6/1	MOTTLES@ 53" WEEPING @ 105"

GROUND SURFACE ELEVATION = 94.54'
HIGH GROUNDWATER ELEVATION =90.11'

TP-19

DEPTH	HORIZON	SOIL CLASS	COLOR	COMMENT
0-28"	Ap &Bw	FINE LOAMY SAND	2.5Y 6/3 10YR5/6	
28-80"	C1	M SAND	2.5Y 6/1	MOTTLES@ 47" WEEPING @ 72"

GROUND SURFACE ELEVATION = 94.16'
HIGH GROUNDWATER ELEVATION =90.22'

TP-20

DEPTH	HORIZON	SOIL CLASS	COLOR	COMMENT
0-29"	Ap &Bw	LOAMY SAND	10YR3/2 10YR5/6	
29-62"	C1	F-M SAND	2.5Y 6/1	MOTTLES@ 48"
62-80"	C2	VERY FINE SANDY LOAM	2.5Y 6/1	
29-96"	C3	F-M SAND	2.5Y 6/1	WEEPING @ 82"

GROUND SURFACE ELEVATION = 92.84'
HIGH GROUNDWATER ELEVATION =88.84'

TP-21

DEPTH	HORIZON	SOIL CLASS	COLOR	COMMENT
0-24"	Ap &Bw	LOAMY SAND	10YR3/2 10YR5/6	
24-80"	C1	F -SAND	2.5Y 6/1	MOTTLES@ 39"
80-96"	C2	M-C SAND	2.5Y 6/1	WEEPING@ 84"

GROUND SURFACE ELEVATION = 93.65'
HIGH GROUNDWATER ELEVATION =90.40'

TP-22

DEPTH	HORIZON	SOIL CLASS	COLOR	COMMENT
0-29"	Ap &Bw	LOAMY SAND	10YR3/2 10YR5/6	
29-108"	C1	F SAND	2.5Y 6/1	MOTTLES@ 58" WEEPING@ 85"

GROUND SURFACE ELEVATION = 95.33'
HIGH GROUNDWATER ELEVATION =90.40'

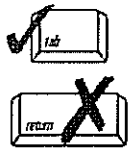
Stormwater Checklist For Solar Farm
67 Chace Road (Map 241, Lot 36)
Freetown, MA

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands Program

Checklist for Stormwater Report

A. Introduction

Important: When filling out forms on the computer, use only the tab key to move your cursor - do not use the return key.



A Stormwater Report must be submitted with the Notice of Intent permit application to document compliance with the Stormwater Management Standards. The following checklist is NOT a substitute for the Stormwater Report (which should provide more substantive and detailed information) but is offered here as a tool to help the applicant organize their Stormwater Management documentation for their Report and for the reviewer to assess this information in a consistent format. As noted in the Checklist, the Stormwater Report must contain the engineering computations and supporting information set forth in Volume 3 of the Massachusetts Stormwater Handbook. The Stormwater Report must be prepared and certified by a Registered Professional Engineer (RPE) licensed in the Commonwealth.

The Stormwater Report must include:

- The Stormwater Checklist completed and stamped by a Registered Professional Engineer (see page 2) that certifies that the Stormwater Report contains all required submittals.[1] This Checklist is to be used as the cover for the completed Stormwater Report.
- Applicant/Project Name
- Project Address
- Name of Firm and Registered Professional Engineer that prepared the Report
- Long-Term Pollution Prevention Plan required by Standards 4-6
- Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan required by Standard 8[2]
- Operation and Maintenance Plan required by Standard 9

In addition to all plans and supporting information, the Stormwater Report must include a brief narrative describing stormwater management practices, including environmentally sensitive site design and LID techniques, along with a diagram depicting runoff through the proposed BMP treatment train. Plans are required to show existing and proposed conditions, identify all wetland resource areas, NRCS soil types, critical areas, Land Uses with Higher Potential Pollutant Loads (LUHPPL), and any areas on the site where infiltration rate is greater than 2.4 inches per hour. The Plans shall identify the drainage areas for both existing and proposed conditions at a scale that enables verification of supporting calculations.

As noted in the Checklist, the Stormwater Management Report shall document compliance with each of the Stormwater Management Standards as provided in the Massachusetts Stormwater Handbook. The soils evaluation and calculations shall be done using the methodologies set forth in Volume 3 of the Massachusetts Stormwater Handbook.

To ensure that the Stormwater Report is complete, applicants are required to fill in the Stormwater Report Checklist by checking the box to indicate that the specified information has been included in the Stormwater Report. If any of the information specified in the checklist has not been submitted, the applicant must provide an explanation. The completed Stormwater Report Checklist and Certification must be submitted with the Stormwater Report.

[1] The Stormwater Report may also include the Illicit Discharge Compliance Statement required by Standard 10. If not included in the Stormwater Report, the Illicit Discharge Compliance Statement must be submitted prior to the discharge of stormwater runoff to the post-construction best management practices.

[2] For some complex projects, it may not be possible to include the Construction Period Erosion and Sedimentation Control Plan in the Stormwater Report. In that event, the issuing authority has the discretion to issue an Order of Conditions that approves the project and includes a condition requiring the proponent to submit the Construction Period Erosion and Sedimentation Control Plan before commencing any land disturbance activity on the site.

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands Program

Checklist for Stormwater Report

B. Stormwater Checklist and Certification

The following checklist is intended to serve as a guide for applicants as to the elements that ordinarily need to be addressed in a complete Stormwater Report. The checklist is also intended to provide conservation commissions and other reviewing authorities with a summary of the components necessary for a comprehensive Stormwater Report that addresses the ten Stormwater Standards.

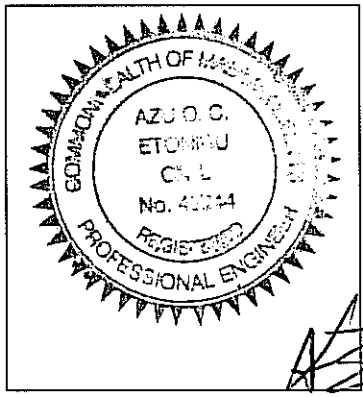
Note: Because stormwater requirements vary from project to project, it is possible that a complete Stormwater Report may not include information on some of the subjects specified in the Checklist. If it is determined that a specific item does not apply to the project under review, please note that the item is not applicable (N.A.) and provide the reasons for that determination.

A complete checklist must include the Certification set forth below signed by the Registered Professional Engineer who prepared the Stormwater Report.

Registered Professional Engineer's Certification

I have reviewed the Stormwater Report, including the soil evaluation, computations, Long-term Pollution Prevention Plan, the Construction Period Erosion and Sedimentation Control Plan (if included), the Long-term Post-Construction Operation and Maintenance Plan, the Illicit Discharge Compliance Statement (if included) and the plans showing the stormwater management system, and have determined that they have been prepared in accordance with the requirements of the Stormwater Management Standards as further elaborated by the Massachusetts Stormwater Handbook. I have also determined that the information presented in the Stormwater Checklist is accurate and that the information presented in the Stormwater Report accurately reflects conditions at the site as of the date of this permit application.

Registered Professional Engineer Block and Signature



Signature and Date AZU ETONIRU 2/28/2022
PE #45244

Checklist

Project Type: Is the application for new development, redevelopment, or a mix of new and redevelopment?

☒ New development

☐ Redevelopment

☐ Mix of New Development and Redevelopment

Checklist for Stormwater Report

Checklist (continued)

LID Measures: Stormwater Standards require LID measures to be considered. Document what environmentally sensitive design and LID Techniques were considered during the planning and design of the project:

- ☒ No disturbance to any Wetland Resource Areas
- ☐ Site Design Practices (e.g. clustered development, reduced frontage setbacks)
- ☐ Reduced Impervious Area (Redevelopment Only)
- ☒ Minimizing disturbance to existing trees and shrubs
- ☐ LID Site Design Credit Requested:
  - ☐ Credit 1
  - ☐ Credit 2
  - ☐ Credit 3
- ☒ Use of "country drainage" versus curb and gutter conveyance and pipe
- ☐ Bioretention Cells (includes Rain Gardens)
- ☐ Constructed Stormwater Wetlands (includes Gravel Wetlands designs)
- ☐ Treebox Filter
- ☐ Water Quality Swale
- ☒ Grass Channel
- ☐ Green Roof
- ☐ Other (describe): _____

Standard 1: No New Untreated Discharges

- ☒ No new untreated discharges
- ☒ Outlets have been designed so there is no erosion or scour to wetlands and waters of the Commonwealth
- ☒ Supporting calculations specified in Volume 3 of the Massachusetts Stormwater Handbook included.

Checklist for Stormwater Report

Checklist (continued)

Standard 2: Peak Rate Attenuation

☐ Standard 2 waiver requested because the project is located in land subject to coastal storm flowage and stormwater discharge is to a wetland subject to coastal flooding.

☒ Evaluation provided to determine whether off-site flooding increases during the 100-year 24-hour storm.

☒ Calculations provided to show that post-development peak discharge rates do not exceed pre-development rates for the 2-year and 10-year 24-hour storms. If evaluation shows that off-site flooding increases during the 100-year 24-hour storm, calculations are also provided to show that post-development peak discharge rates do not exceed pre-development rates for the 100-year 24-hour storm.

Standard 3: Recharge

☒ Soil Analysis provided.

☒ Required Recharge Volume calculation provided.

☐ Required Recharge volume reduced through use of the LID site Design Credits.

☒ Sizing the infiltration, BMPs is based on the following method: Check the method used.

☒ Static ☐ Simple Dynamic ☐ Dynamic Field[1]

☒ Runoff from all impervious areas at the site discharging to the infiltration BMP.

☐ Runoff from all impervious areas at the site is *not* discharging to the infiltration BMP and calculations are provided showing that the drainage area contributing runoff to the infiltration BMPs is sufficient to generate the required recharge volume.

☒ Recharge BMPs have been sized to infiltrate the Required Recharge Volume.

☐ Recharge BMPs have been sized to infiltrate the Required Recharge Volume *only* to the maximum extent practicable for the following reason:

- ☐ Site is comprised solely of C and D soils and/or bedrock at the land surface
- ☐ M.G.L. c. 21E sites pursuant to 310 CMR 40.0000
- ☐ Solid Waste Landfill pursuant to 310 CMR 19.000
- ☐ Project is otherwise subject to Stormwater Management Standards only to the maximum extent practicable.

☒ Calculations showing that the infiltration BMPs will drain in 72 hours are provided.

☐ Property includes a M.G.L. c. 21E site or a solid waste landfill and a mounding analysis is included.

[1] 80% TSS removal is required prior to discharge to infiltration BMP if Dynamic Field method is used.

Checklist for Stormwater Report

Checklist (continued)

Standard 3: Recharge (continued)

☐ The infiltration BMP is used to attenuate peak flows during storms greater than or equal to the 10-year 24-hour storm and separation to seasonal high groundwater is less than 4 feet and a mounding analysis is provided.

☒ Documentation is provided showing that infiltration BMPs do not adversely impact nearby wetland resource areas.

Standard 4: Water Quality

The Long-Term Pollution Prevention Plan typically includes the following:

- Good housekeeping practices;
- Provisions for storing materials and waste products inside or under cover;
- Vehicle washing controls;
- Requirements for routine inspections and maintenance of stormwater BMPs;
- Spill prevention and response plans;
- Provisions for maintenance of lawns, gardens, and other landscaped areas;
- Requirements for storage and use of fertilizers, herbicides, and pesticides;
- Pet waste management provisions;
- Provisions for operation and management of septic systems;
- Provisions for solid waste management;
- Snow disposal and plowing plans relative to Wetland Resource Areas;
- Winter Road Salt and/or Sand Use and Storage restrictions;
- Street sweeping schedules;
- Provisions for prevention of illicit discharges to the stormwater management system;
- Documentation that Stormwater BMPs are designed to provide for shutdown and containment in the event of a spill or discharges to or near critical areas or from LUHPPL;
- Training for staff or personnel involved with implementing Long-Term Pollution Prevention Plan;
- List of Emergency contacts for implementing Long-Term Pollution Prevention Plan.

☒ A Long-Term Pollution Prevention Plan is attached to Stormwater Report and is included as an attachment to the Wetlands Notice of Intent.

☐ Treatment BMPs subject to the 44% TSS removal pretreatment requirement and the one inch rule for calculating the water quality volume are included, and discharge:

- ☐ is within the Zone II or Interim Wellhead Protection Area
- ☐ is near or to other critical areas
- ☐ is within soils with a rapid infiltration rate (greater than 2.4 inches per hour)
- ☐ involves runoff from land uses with higher potential pollutant loads.

☐ The Required Water Quality Volume is reduced through use of the LID site Design Credits.

☐ Calculations documenting that the treatment train meets the 80% TSS removal requirement and, if applicable, the 44% TSS removal pretreatment requirement, are provided.

Checklist for Stormwater Report

Checklist (continued)

Standard 4: Water Quality (continued)

☐ The BMP is sized (and calculations provided) based on:

- ☐ The ½" or 1" Water Quality Volume or
- ☐ The equivalent flow rate associated with the Water Quality Volume and documentation is provided showing that the BMP treats the required water quality volume.

☐ The applicant proposes to use proprietary BMPs, and documentation supporting use of proprietary BMP and proposed TSS removal rate is provided. This documentation may be in the form of the propriety BMP checklist found in Volume 2, Chapter 4 of the Massachusetts Stormwater Handbook and submitting copies of the TARP Report, STEP Report, and/or other third party studies verifying performance of the proprietary BMPs.

☐ A TMDL exists that indicates a need to reduce pollutants other than TSS and documentation showing that the BMPs selected are consistent with the TMDL is provided.

Standard 5: Land Uses With Higher Potential Pollutant Loads (LUHPPLs)

☐ The NPDES Multi-Sector General Permit covers the land use and the Stormwater Pollution Prevention Plan (SWPPP) has been included with the Stormwater Report.

☐ The NPDES Multi-Sector General Permit covers the land use and the SWPPP will be submitted ***prior to*** the discharge of stormwater to the post-construction stormwater BMPs.

☐ The NPDES Multi-Sector General Permit does ***not*** cover the land use.

☐ LUHPPLs are located at the site and industry specific source control and pollution prevention measures have been proposed to reduce or eliminate the exposure of LUHPPLs to rain, snow, snow melt and runoff, and been included in the long term Pollution Prevention Plan.

☐ All exposure has been eliminated.

☐ All exposure has ***not*** been eliminated and all BMPs selected are on MassDEP LUHPPL list.

☐ The LUHPPL has the potential to generate runoff with moderate to higher concentrations of oil and grease (e.g. all parking lots with >1000 vehicle trips per day) and the treatment train includes an oil grit separator, a filtering bioretention area, a sand filter or equivalent.

Standard 6: Critical Areas

☒ The discharge is near or to a critical area and the treatment train includes only BMPs that MassDEP has approved for stormwater discharges to or near that particular class of critical area.

☒ Critical areas and BMPs are identified in the Stormwater Report.

Checklist for Stormwater Report

Checklist (continued)

Standard 7: Redevelopments and Other Projects Subject to the Standards only to the maximum extent practicable

☐ The project is subject to the Stormwater Management Standards only to the maximum Extent Practicable as a:

- ☐ Limited Project
- ☐ Small Residential Projects: 5-9 single family houses or 5-9 units in a multi-family development provided there is no discharge that may potentially affect a critical area.
- ☐ Small Residential Projects: 2-4 single family houses or 2-4 units in a multi-family development with a discharge to a critical area
- ☐ Marina and/or boatyard provided the hull painting, service and maintenance areas are protected from exposure to rain, snow, snow melt and runoff
- ☐ Bike Path and/or Foot Path
- ☐ Redevelopment Project
- ☐ Redevelopment portion of mix of new and redevelopment.

☐ Certain standards are not fully met (Standard No. 1, 8, 9, and 10 must always be fully met) and an explanation of why these standards are not met is contained in the Stormwater Report.

☐ The project involves redevelopment and a description of all measures that have been taken to improve existing conditions is provided in the Stormwater Report. The redevelopment checklist found in Volume 2 Chapter 3 of the Massachusetts Stormwater Handbook may be used to document that the proposed stormwater management system (a) complies with Standards 2, 3 and the pretreatment and structural BMP requirements of Standards 4-6 to the maximum extent practicable and (b) improves existing conditions.

Standard 8: Construction Period Pollution Prevention and Erosion and Sedimentation Control

A Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan must include the following information:

- Narrative;
- Construction Period Operation and Maintenance Plan;
- Names of Persons or Entity Responsible for Plan Compliance;
- Construction Period Pollution Prevention Measures;
- Erosion and Sedimentation Control Plan Drawings;
- Detail drawings and specifications for erosion control BMPs, including sizing calculations;
- Vegetation Planning;
- Site Development Plan;
- Construction Sequencing Plan;
- Sequencing of Erosion and Sedimentation Controls;
- Operation and Maintenance of Erosion and Sedimentation Controls;
- Inspection Schedule;
- Maintenance Schedule;
- Inspection and Maintenance Log Form.

☒ A Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan containing the information set forth above has been included in the Stormwater Report.

Checklist for Stormwater Report

Checklist (continued)

Standard 8: Construction Period Pollution Prevention and Erosion and Sedimentation Control (continued)

☐ The project is highly complex and information is included in the Stormwater Report that explains why it is not possible to submit the Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan with the application. A Construction Period Pollution Prevention and Erosion and Sedimentation Control has ***not*** been included in the Stormwater Report but will be submitted ***before*** land disturbance begins.

☐ The project is ***not*** covered by a NPDES Construction General Permit.

☐ The project is covered by a NPDES Construction General Permit and a copy of the SWPPP is in the Stormwater Report.

☒ The project is covered by a NPDES Construction General Permit but no SWPPP been submitted. The SWPPP will be submitted BEFORE land disturbance begins.

Standard 9: Operation and Maintenance Plan

☒ The Post Construction Operation and Maintenance Plan is included in the Stormwater Report and includes the following information:

- ☒ Name of the stormwater management system owners;
- ☒ Party responsible for operation and maintenance;
- ☒ Schedule for implementation of routine and non-routine maintenance tasks;
- ☒ Plan showing the location of all stormwater BMPs maintenance access areas;
- ☒ Description and delineation of public safety features;
- ☒ Estimated operation and maintenance budget; and
- ☒ Operation and Maintenance Log Form.

☐ The responsible party is ***not*** the owner of the parcel where the BMP is located and the Stormwater Report includes the following submissions:

- ☐ A copy of the legal instrument (deed, homeowner's association, utility trust or other legal entity) that establishes the terms of and legal responsibility for the operation and maintenance of the project site stormwater BMPs;
- ☐ A plan and easement deed that allows site access for the legal entity to operate and maintain BMP functions.

Standard 10: Prohibition of Illicit Discharges

☒ The Long-Term Pollution Prevention Plan includes measures to prevent illicit discharges;

☒ An Illicit Discharge Compliance Statement is attached;

☐ NO Illicit Discharge Compliance Statement is attached but will be submitted ***prior to*** the discharge of any stormwater to post-construction BMPs.

CHACE ROAD SOLAR FARM
67 CHACE ROAD
FREETOWN, MA

REQUIRED STORMWATER RECHARGE VOLUME VERIFICATION USING STATIC METHOD AND DRAWDOWN ANALYSIS

THE IMPERVIOUS AREAS STATED BELOW ARE TAKEN TO BE THE SURFICIAL AREAS OF THE SOLAR PANEL TABLES (318.6 S.F. PER TABLE) RATHER THAN SIMPLY THE SOLAR SUPPORT POSTS SOLEY TO DEVELOP A REASONABLE RECHARGE VOLUME REQUIREMENT THAT OTHERWISE WOULD BE ABSENT CONSIDERING SUPPORT POSTS ALONE. STORAGE VOLUMES INDICATED BELOW INCLUDE ONLY THE AVAILABLE VOLUME FOR WATER STORAGE BETWEEN THE BASIN SURFACE AND THE LIP OF THE SURROUNDING BERM AND NO CREDIT IS TAKEN FOR THE VOLUME OF VOIDS BENEATH THE BASIN SURFACE WITHIN WHICH WATER INFILTRATE WOULD INTO THE SOIL.

PV ARRAY G2 – 103 PANEL TABLES (PT)

RECHARGE VOLUME VERIFICATION

REQUIRED RUNOFF VOLUME = NEW IMPERVIOUS AREA * TARGET DEPTH FACTOR

= (103 PT) * 318.6 S.F./ PT + (1250 S.F / EQUIP PAD)
= (34,065 SF.)* (1 IN) * (1FT / 12IN)
= 2,840 C.F.

AVAILABLE STORAGE VOLUME OF BASIN WITHIN ARRAY FOOTPRINT = 78,032 C.F. (SEE HYDROCAD ANALYSIS SHEET PG 23)

PROVIDED STORAGE VOLUME > REQUIRED RUNOFF VOLUME
(78,032 C.F. > 2,840C.F.)

DRAWDOWN

DRAWDOWN TIME = REQUIRED RECHARGE VOLUME / (INFILTRATION RATE *BOTTOM AREA)

=(2,840 C.F. / (2.41 IN/HR *(1FT/ 12IN) * 67,992 S.F.)
= 0.02 HOURS
0.02 HOURS < 72 HOURS

PV ARRAY G3 - 145 PANEL TABLES (PT)

RECHARGE VOLUME VERIFICATION

REQUIRED RUNOFF VOLUME = NEW IMPERVIOUS AREA * TARGET DEPTH FACTOR

= (145 PT) * 318.6 S.F./ PT+ (1250 S.F / EQUIP PAD)
= (47,447 S.F.)* (1 IN) * (1FT / 12IN)
= 3,954 C.F.

AVAILABLE STORAGE VOLUME OF BASIN WITHIN ARRAY FOOTPRINT = 51,418 C.F. (SEE HYDROCAD ANALYSIS SHEET 25)

PROVIDED STORAGE VOLUME > REQUIRED RUNOFF VOLUME
(51,418 C.F. > 3,954 C.F.)

DRAWDOWN

DRAWDOWN TIME = REQUIRED RECHARGE VOLUME / (INFILTRATION RATE *BOTTOM AREA)
=(3,954 C.F. / (2.41 IN/HR *(1FT/ 12IN) * 37,597 S.F.)
= 0.04 HOURS
0.04 HOURS < 72 HOURS

ANALYSIS OF THE HYDROCAD MODEL FOR ARRAY G2 AND G3 DEMONSTRATE THAT THE VOLUME OF WATER PONDED DURING THE 100 YEAR EVENT INFILTRATES INTO THE SOIL WITHIN 1-2 HOURS RESPECTIVELY- SEE ATTACHED HYDROCAD TABLES – NEXT PAGE
IT FOLLOWS THAT THE TIME TO COMPLETELY DRAIN THE BASINS FOLLOWING THE 2 & 10 YEAR EVENTS WILL BE LOWER THAN THAT OF THE 100 YEAR EVENT

Hydrograph for Pond 1P: BASIN G2

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Outflow (cfs)	Discarded (cfs)	Primary (cfs)
0.10	0.00	0	90.50	0.00	0.00	**0.00**
1.10	0.00	0	90.50	0.00	0.00	0.00
2.10	0.00	0	90.50	0.00	0.00	0.00
3.10	0.00	0	90.50	0.00	0.00	0.00
4.10	0.00	0	90.50	0.00	0.00	0.00
5.10	0.00	0	90.50	0.00	0.00	0.00
6.10	0.00	0	90.50	0.00	0.00	0.00
7.10	0.00	0	90.50	0.00	0.00	0.00
8.10	0.00	0	90.50	0.00	0.00	0.00
9.10	0.00	0	90.50	0.00	0.00	0.00
10.10	0.00	0	90.50	0.00	0.00	0.00
11.10	0.00	0	90.50	0.00	0.00	0.00
12.10	**5.50**	**1,180**	**90.52**	**3.31**	**3.31**	0.00
13.10	0.74	**290**	**90.50**	**0.81**	**0.81**	0.00
14.10	0.53	197	90.50	0.55	0.55	0.00
15.10	0.43	156	90.50	0.44	0.44	0.00
16.10	0.31	113	90.50	0.32	0.32	0.00
17.10	0.25	92	90.50	0.26	0.26	0.00
18.10	0.20	72	90.50	0.20	0.20	0.00
19.10	0.18	65	90.50	0.18	0.18	0.00
20.10	0.16	59	90.50	0.16	0.16	0.00
21.10	0.15	54	90.50	0.15	0.15	0.00
22.10	0.14	49	90.50	0.14	0.14	0.00
23.10	0.12	45	90.50	0.13	0.13	0.00
24.10	0.04	33	90.50	0.09	0.09	0.00
25.10	0.00	0	90.50	0.00	0.00	0.00
26.10	0.00	0	90.50	0.00	0.00	0.00
27.10	0.00	0	90.50	0.00	0.00	0.00
28.10	0.00	0	90.50	0.00	0.00	0.00
29.10	0.00	0	90.50	0.00	0.00	0.00
30.10	0.00	0	90.50	0.00	0.00	0.00
31.10	0.00	0	90.50	0.00	0.00	0.00
32.10	0.00	0	90.50	0.00	0.00	0.00
33.10	0.00	0	90.50	0.00	0.00	0.00
34.10	0.00	0	90.50	0.00	0.00	0.00
35.10	0.00	0	90.50	0.00	0.00	0.00

Hydrograph for Pond 2P: BASIN G3

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Outflow (cfs)	Discarded (cfs)	Primary (cfs)
0.10	0.00	0	94.20	0.00	0.00	**0.00**
1.10	0.00	0	94.20	0.00	0.00	0.00
2.10	0.00	0	94.20	0.00	0.00	0.00
3.10	0.00	0	94.20	0.00	0.00	0.00
4.10	0.00	0	94.20	0.00	0.00	0.00
5.10	0.00	0	94.20	0.00	0.00	0.00
6.10	0.00	0	94.20	0.00	0.00	0.00
7.10	0.00	0	94.20	0.00	0.00	0.00
8.10	0.00	0	94.20	0.00	0.00	0.00
9.10	0.00	0	94.20	0.00	0.00	0.00
10.10	0.00	0	94.20	0.00	0.00	0.00
11.10	0.00	0	94.20	0.00	0.00	0.00
12.10	**4.65**	**736**	**94.22**	**2.11**	**2.11**	0.00
13.10	**1.11**	**3,926**	**94.30**	**2.15**	**2.15**	0.00
14.10	0.76	178	94.20	0.83	0.83	0.00
15.10	0.60	132	94.20	0.61	0.61	0.00
16.10	0.44	96	94.20	0.45	0.45	0.00
17.10	0.36	77	94.20	0.36	0.36	0.00
18.10	0.28	61	94.20	0.28	0.28	0.00
19.10	0.25	54	94.20	0.25	0.25	0.00
20.10	0.23	49	94.20	0.23	0.23	0.00
21.10	0.21	45	94.20	0.21	0.21	0.00
22.10	0.19	41	94.20	0.19	0.19	0.00
23.10	0.17	37	94.20	0.17	0.17	0.00
24.10	0.13	32	94.20	0.15	0.15	0.00
25.10	0.00	0	94.20	0.00	0.00	0.00
26.10	0.00	0	94.20	0.00	0.00	0.00
27.10	0.00	0	94.20	0.00	0.00	0.00
28.10	0.00	0	94.20	0.00	0.00	0.00
29.10	0.00	0	94.20	0.00	0.00	0.00
30.10	0.00	0	94.20	0.00	0.00	0.00
31.10	0.00	0	94.20	0.00	0.00	0.00
32.10	0.00	0	94.20	0.00	0.00	0.00
33.10	0.00	0	94.20	0.00	0.00	0.00
34.10	0.00	0	94.20	0.00	0.00	0.00
35.10	0.00	0	94.20	0.00	0.00	0.00

STORMWATER SYSTEM OPERATION AND MAINTENANCE PROGRAM

Chace Road Solar Farm

(Assessor's Map 241, Lot 36)

Freetown, MA

February 2021

Revised February 2022

The current landowner of the project site is Chipaway Corporation. The owner of the proposed stormwater management system will be TJA Clean Energy LLC., following the approval of the Site Plans by the Freetown Planning Board and Conservation Commission. TJA Clean Energy LLC., or its successor in interest will be responsible for the ongoing operation and maintenance of the stormwater management system until such time the solar facility is leased or sold, or otherwise decommissioned following its useful life. The responsibility of the operator of the solar facility for the operation and maintenance of the stormwater management system shall be listed within a deed or lease agreement and shall be recorded in the Bristol County Registry (Fall River).

Access to the solar arrays will be via locked gates that only authorized personnel have control of.

The site drainage system consists of multiple spacious depressions within each array that provide temporary storage for stormwater flows until the highly permeable sandy soils infiltrate the entire volume. In addition, along portions of the perimeter of the arrays, the proposed grading includes shallow 6-inch gravel roadway to prevent runoff from flowing directly out of the arrays and to direct the stormwater towards the depression areas. In order to ensure future and on-going proper and adequate functioning of the drainage system for the Chace Road Solar project, the owner shall at a minimum institute the following maintenance program:

Between March 1st and October 30th, the perimeter gravel roadways shall be monitored for evidence of erosion, and the grassed depressions shall be checked for erosion, sedimentation, and appropriate vegetative coverage. An inspection should be performed quarterly and preferably within the months of April, June, and September. Any eroded soils shall be replaced and stabilized with adequate grass mix planted over a 4 to 6-inch clean loam. Any build up of sediments within the depressions shall be removed using hand techniques. Mowing or weed-whacking will only be allowed between November 1st and March 1st to allow wildlife to utilize the grassland habitat. These activities would ideally be conducted in November or December once all the leaves have fallen from the trees and before the onset of winter conditions and snow cover. During this time, excess vegetation growth shall be removed to ensure that the grass surface of the berms has not sustained damage from erosion. Fallen leaves within the depressions shall be hand raked and removed from the area in order to ensure successful operation of the planted grass mix.

Illicit Discharge Statement

No illicit discharge (including sanitary wastewater, oil, grease, etc.) shall be dumped onsite. The owner/operator of the facility shall maintain an active log for the maintenance of the drainage system. The log shall be subject to random review by the Town of Freetown for compliance verification. The log shall include the date of inspection and action undertaken as a maintenance action and the name and signature of the person who conducted the inspection and maintenance. Any accidental discharge of reportable quantity of oil or hazardous material at the site must be cleaned up pursuant to MGL Ch. 21E, as amended and 310 CMR 40 (the Massachusetts Contingency Plan). The operation and maintenance requirement for this facility shall be on-going.

The maintenance log shall include the name, address and phone number of the person responsible for the maintenance and operation of the stormwater system and shall be duly executed and signed by the responsible person and submitted to the Planning Board for its review, approval and record prior to any activation of the overall system.

The annual operations and maintenance budget is expected to be $12,500 annually.

POST-CONSTRUCTION
STORMWATER SYSTEM OPERATION
SEMI-ANNUAL INSPECTION LOG

OWNER: TJA CLEAN ENERGY
LOCATION : 67 CHACE ROAD
DATE : _____

SYSTEM COMPONENT	OBSERVED CONDITIONS	RECOMMENDED ACTION	INSPECTOR'S NAME

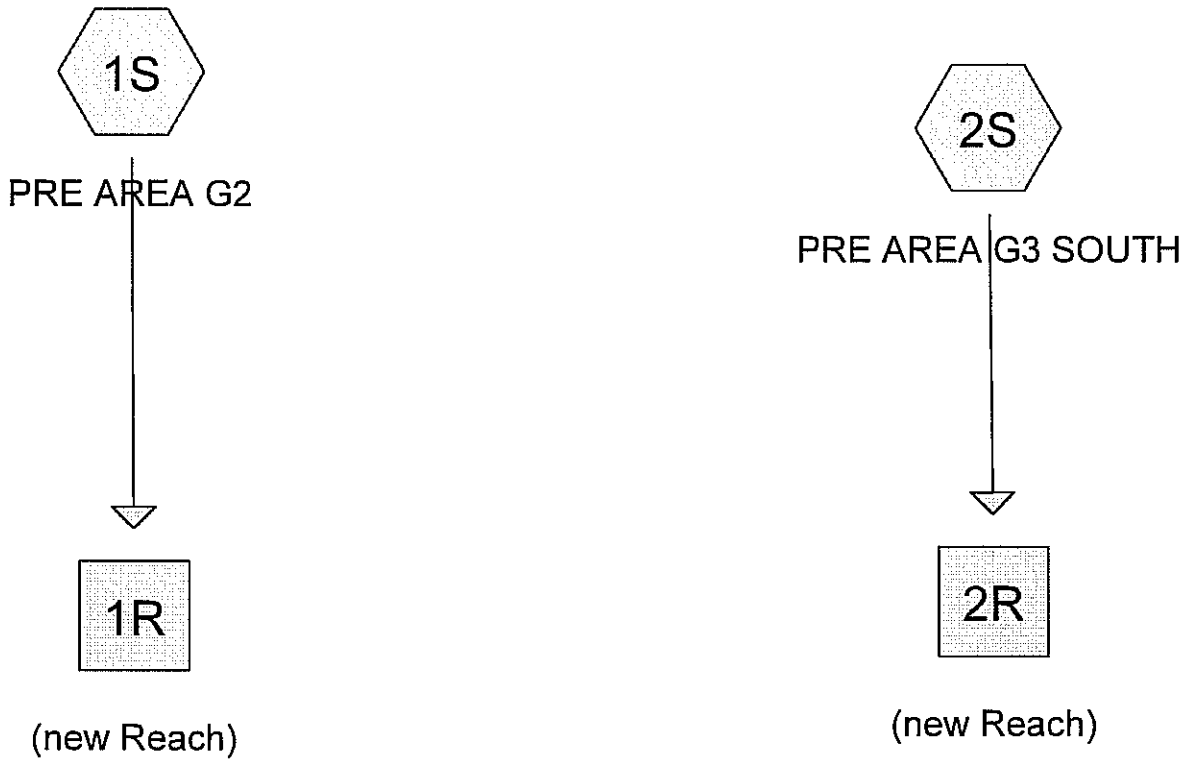
I HEREBY CERTIFY UNDER THE PENALTY AND PAINS OF PERJURY THAT THE ABOVE STATEMENTS AND INSPECTION WERE MADE BY ME AND ARE ACCURATE, TO THE BEST OF MY KNOWLEDGE.

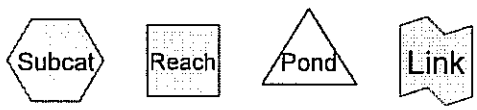
_____ _____
INSPECTOR'S SIGNATURE DATE

Existing Conditions Analysis Data For Solar Farm
67 Chace Road (Map 241, Lot 36)
Freetown, MA

PV ARRAY AREA "G2"

PV ARRAY AREA G3





Routing Diagram for PRE CONDITIONS CHACE
Prepared by E. T. ENGINEERING ENT., INC., Printed 2/3/2022

Rainfall Events Listing

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	2-Year	Type III 24-hr		Default	24.00	1	3.31	2
2	10-Year	Type III 24-hr		Default	24.00	1	4.88	2
3	100-Year	Type III 24-hr		Default	24.00	1	8.52	2

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.318	72	Dirt roads, HSG A (2S)
2.598	77	Newly graded area, HSG A (1S)
0.124	36	Woods, Fair, HSG A (1S)
3.451	30	Woods, Good, HSG A (2S)
6.491	**51**	**TOTAL AREA**

Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
6.491	HSG A	1S, 2S
0.000	HSG B	
0.000	HSG C	
0.000	HSG D	
0.000	Other	
6.491		**TOTAL AREA**

Ground Covers (all nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
0.318	0.000	0.000	0.000	0.000	0.318	Dirt roads	2S
2.598	0.000	0.000	0.000	0.000	2.598	Newly graded area	1S
0.124	0.000	0.000	0.000	0.000	0.124	Woods, Fair	1S
3.451	0.000	0.000	0.000	0.000	3.451	Woods, Good	2S
6.491	**0.000**	**0.000**	**0.000**	**0.000**	**6.491**	**TOTAL AREA**	

Time span=0.10-30.00 hrs, dt=0.05 hrs, 599 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 1S: PRE AREA G2 Runoff Area=118,578 sf 0.00% Impervious Runoff Depth=1.17"
Flow Length=88' Tc=6.0 min CN=75 Runoff=3.53 cfs 0.265 af

Subcatchment 2S: PRE AREA G3 SOUTH Runoff Area=164,152 sf 0.00% Impervious Runoff Depth=0.00"
Flow Length=205' Tc=13.5 min CN=34 Runoff=0.00 cfs 0.000 af

Reach 1R: (new Reach) Inflow=3.53 cfs 0.265 af
Outflow=3.53 cfs 0.265 af

Reach 2R: (new Reach) Inflow=0.00 cfs 0.000 af
Outflow=0.00 cfs 0.000 af

Total Runoff Area = 6.491 ac Runoff Volume = 0.265 af Average Runoff Depth = 0.49"
100.00% Pervious = 6.491 ac 0.00% Impervious = 0.000 ac

Summary for Subcatchment 1S: PRE AREA G2

3-INCH OD ROUND STEEL PANEL SUPPORTS. FOUR SUPPORTS PER PANEL TABLE.
IMPERVIOUS AREA PER PANEL TABLE IS 0.196 S.F.

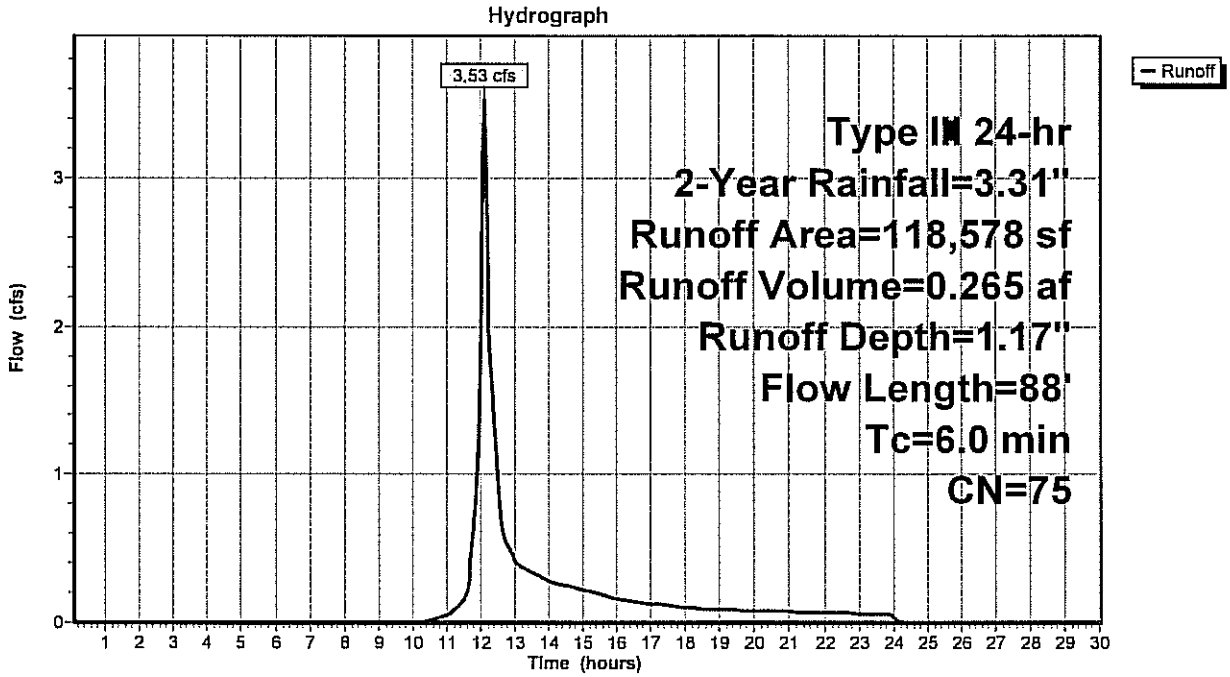
Runoff = 3.53 cfs @ 12.10 hrs, Volume= 0.265 af, Depth= 1.17"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.10-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.31"

Area (sf)	CN	Description
5,404	36	Woods, Fair, HSG A
113,174	77	Newly graded area, HSG A
118,578	75	Weighted Average
118,578		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.6	68	0.1600	2.00		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.5	20	0.0050	0.71		**Shallow Concentrated Flow,** Nearly Bare & Untilled Kv= 10.0 fps
4.9					**Direct Entry, add 4.9 to get 6 min**
6.0	88	Total			

Subcatchment 1S: PRE AREA G2



Summary for Subcatchment 2S: PRE AREA G3 SOUTH

[45] Hint: Runoff=Zero

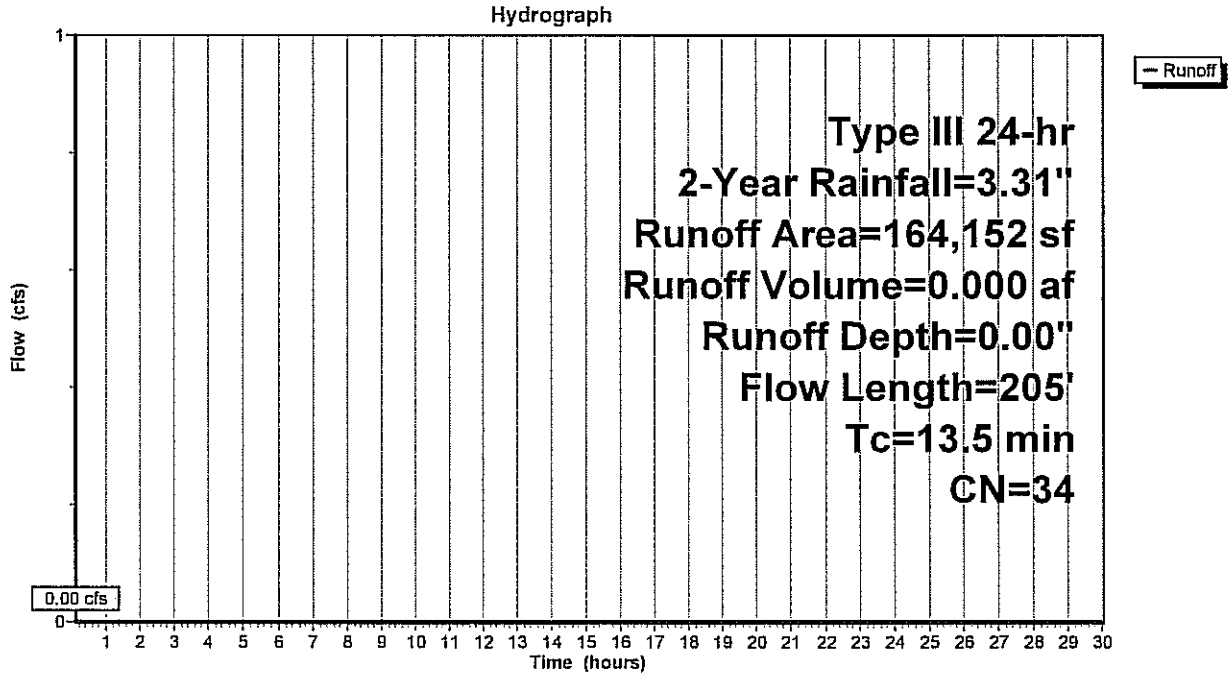
Runoff = 0.00 cfs @ 0.10 hrs, Volume= 0.000 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.10-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.31"

Area (sf)	CN	Description
150,304	30	Woods, Good, HSG A
13,848	72	Dirt roads, HSG A
164,152	34	Weighted Average
164,152		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.9	20	0.0200	0.03		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.50"
0.9	55	0.0450	1.06		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.7	40	0.0380	0.97		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
2.0	90	0.0220	0.74		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
13.5	205	Total			

Subcatchment 2S: PRE AREA G3 SOUTH



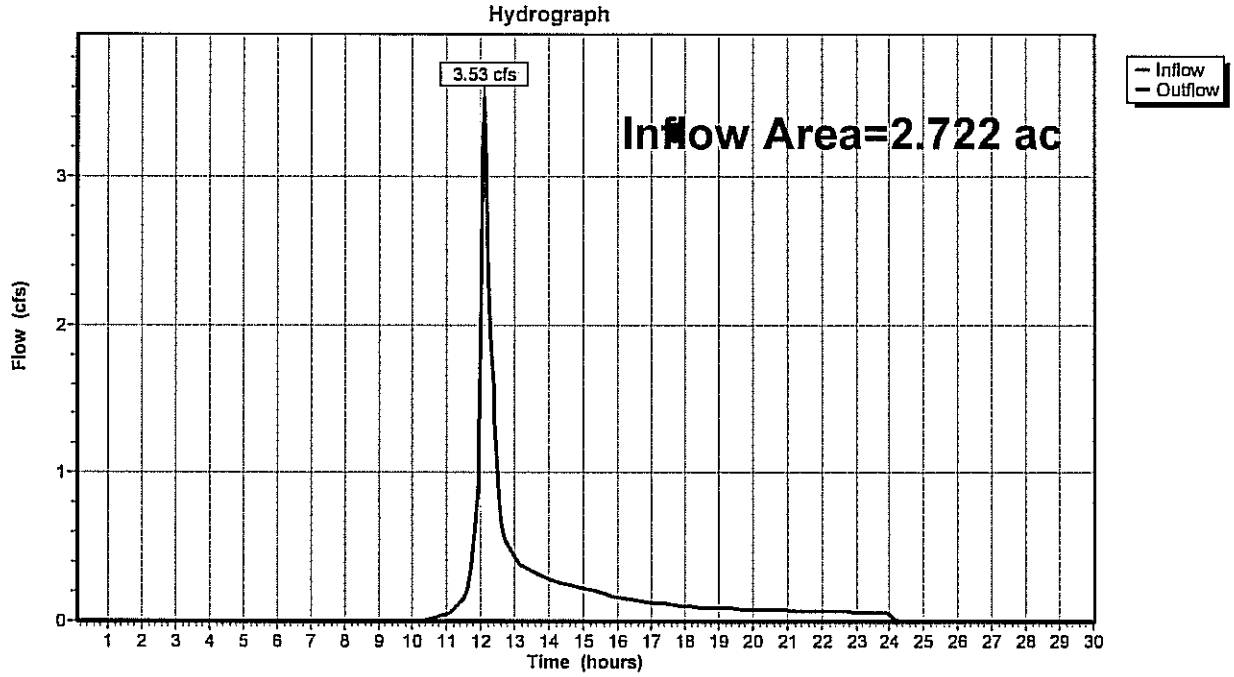
Summary for Reach 1R: (new Reach)

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 2.722 ac, 0.00% Impervious, Inflow Depth = 1.17" for 2-Year event
Inflow = 3.53 cfs @ 12.10 hrs, Volume= 0.265 af
Outflow = 3.53 cfs @ 12.10 hrs, Volume= 0.265 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.10-30.00 hrs, dt= 0.05 hrs

Reach 1R: (new Reach)



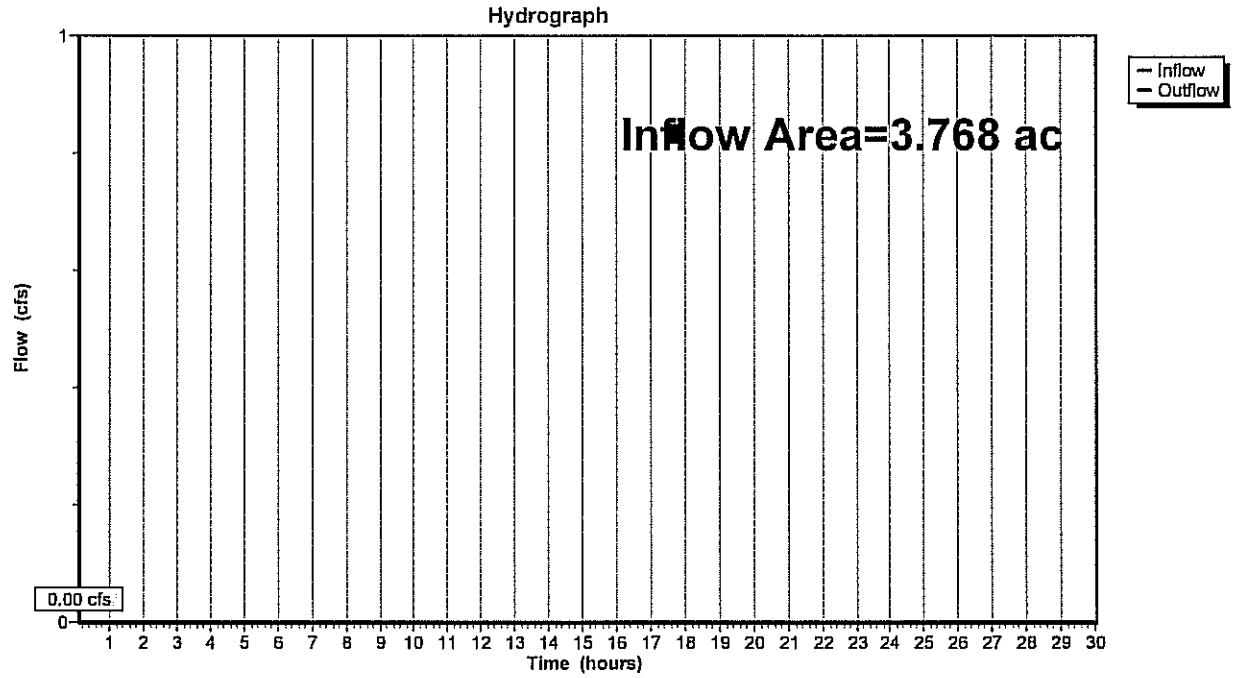
Summary for Reach 2R: (new Reach)

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 3.768 ac, 0.00% Impervious, Inflow Depth = 0.00" for 2-Year event
Inflow = 0.00 cfs @ 0.10 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 0.10 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.10-30.00 hrs, dt= 0.05 hrs

Reach 2R: (new Reach)



Time span=0.10-30.00 hrs, dt=0.05 hrs, 599 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 1S: PRE AREA G2 Runoff Area=118,578 sf 0.00% Impervious Runoff Depth=2.35"
Flow Length=88' Tc=6.0 min CN=75 Runoff=7.34 cfs 0.534 af

Subcatchment 2S: PRE AREA G3 SOUTH Runoff Area=164,152 sf 0.00% Impervious Runoff Depth=0.05"
Flow Length=205' Tc=13.5 min CN=34 Runoff=0.02 cfs 0.015 af

Reach 1R: (new Reach) Inflow=7.34 cfs 0.534 af
Outflow=7.34 cfs 0.534 af

Reach 2R: (new Reach) Inflow=0.02 cfs 0.015 af
Outflow=0.02 cfs 0.015 af

Total Runoff Area = 6.491 ac Runoff Volume = 0.549 af Average Runoff Depth = 1.01"
100.00% Pervious = 6.491 ac 0.00% Impervious = 0.000 ac

Summary for Subcatchment 1S: PRE AREA G2

3-INCH OD ROUND STEEL PANEL SUPPORTS. FOUR SUPPORTS PER PANEL TABLE.
IMPERVIOUS AREA PER PANEL TABLE IS 0.196 S.F.

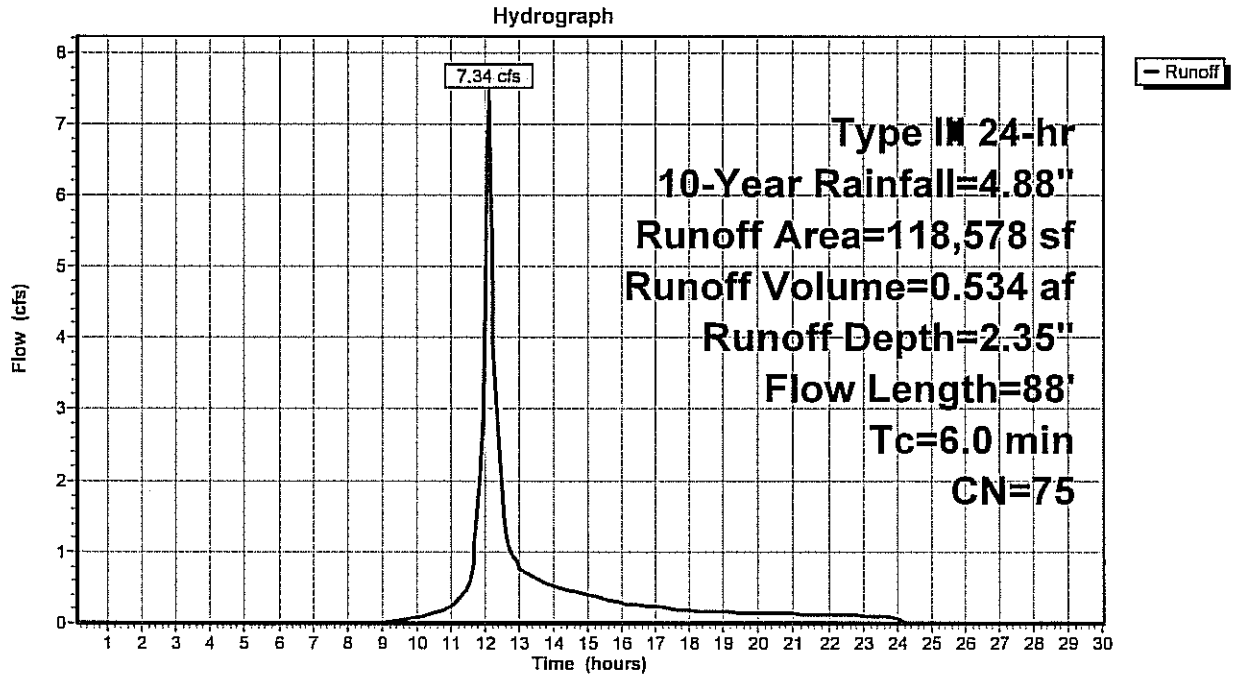
Runoff = 7.34 cfs @ 12.09 hrs, Volume= 0.534 af, Depth= 2.35"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.10-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.88"

Area (sf)	CN	Description
5,404	36	Woods, Fair, HSG A
113,174	77	Newly graded area, HSG A
118,578	75	Weighted Average
118,578		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.6	68	0.1600	2.00		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.5	20	0.0050	0.71		**Shallow Concentrated Flow,** Nearly Bare & Untilled Kv= 10.0 fps
4.9					**Direct Entry, add 4.9 to get 6 min**
6.0	88	Total			

Subcatchment 1S: PRE AREA G2



Summary for Subcatchment 2S: PRE AREA G3 SOUTH

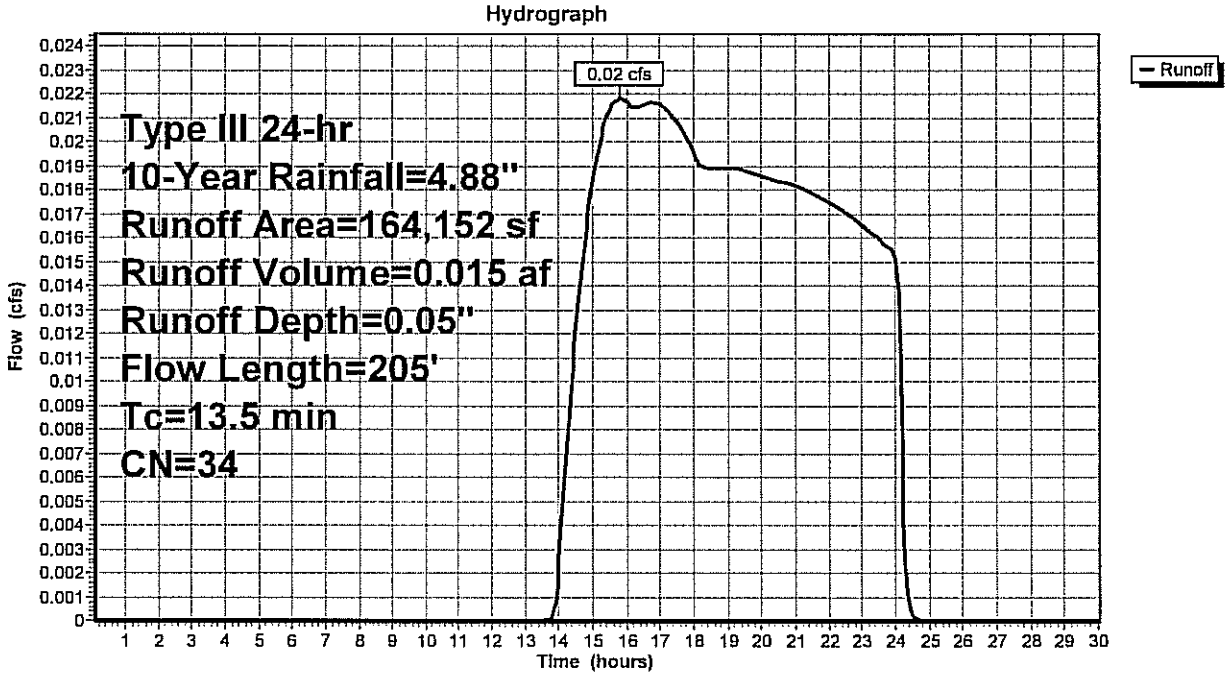
Runoff = 0.02 cfs @ 15.81 hrs, Volume= 0.015 af, Depth= 0.05"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.10-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.88"

Area (sf)	CN	Description
150,304	30	Woods, Good, HSG A
13,848	72	Dirt roads, HSG A
164,152	34	Weighted Average
164,152		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.9	20	0.0200	0.03		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.50"
0.9	55	0.0450	1.06		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.7	40	0.0380	0.97		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
2.0	90	0.0220	0.74		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
13.5	205	Total			

Subcatchment 2S: PRE AREA G3 SOUTH



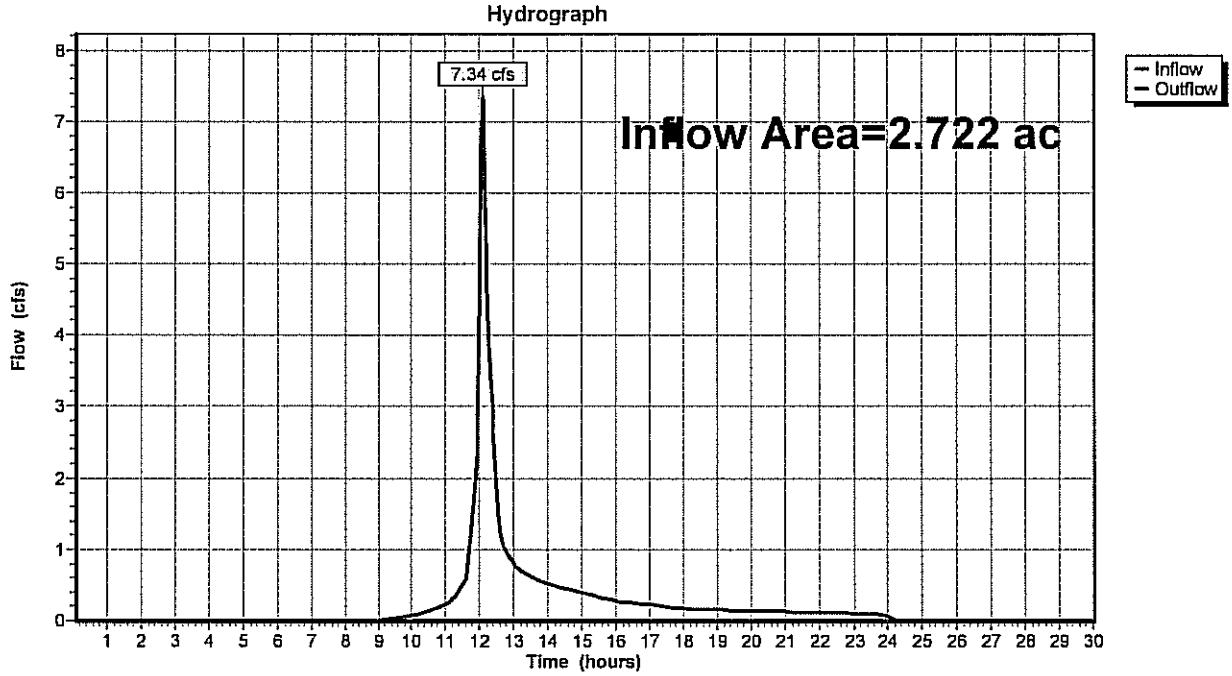
Summary for Reach 1R: (new Reach)

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 2.722 ac, 0.00% Impervious, Inflow Depth = 2.35" for 10-Year event
Inflow = 7.34 cfs @ 12.09 hrs, Volume= 0.534 af
Outflow = 7.34 cfs @ 12.09 hrs, Volume= 0.534 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.10-30.00 hrs, dt= 0.05 hrs

Reach 1R: (new Reach)



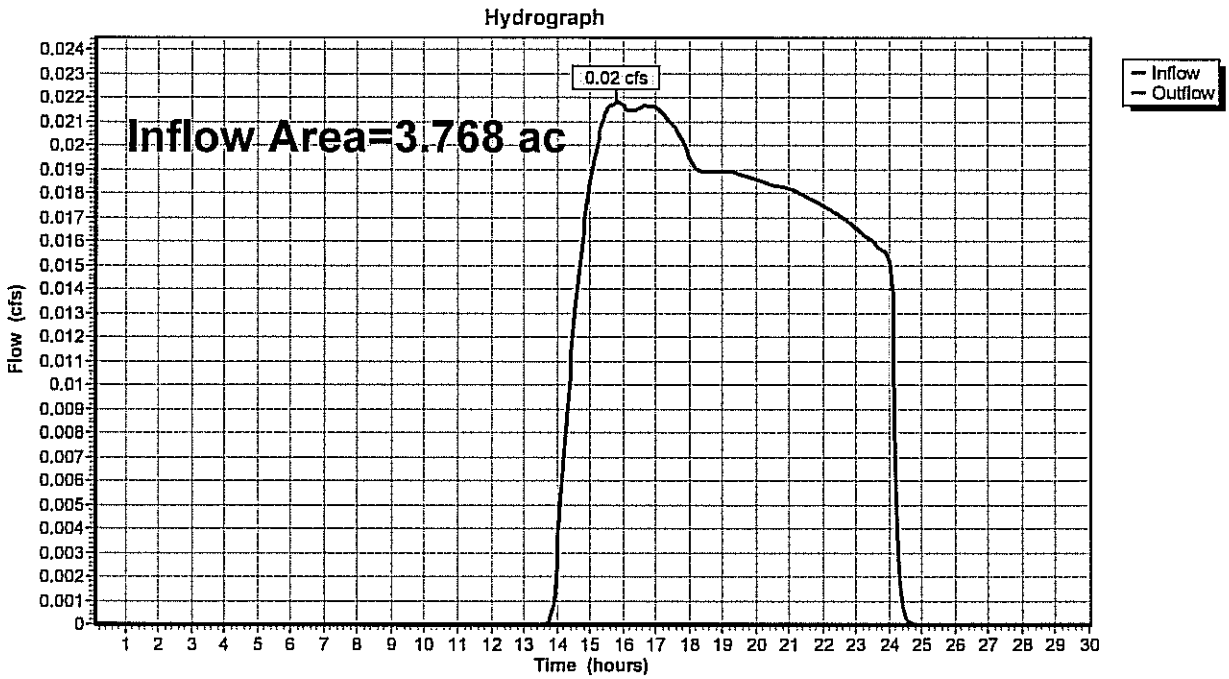
Summary for Reach 2R: (new Reach)

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 3.768 ac, 0.00% Impervious, Inflow Depth = 0.05" for 10-Year event
Inflow = 0.02 cfs @ 15.81 hrs, Volume= 0.015 af
Outflow = 0.02 cfs @ 15.81 hrs, Volume= 0.015 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.10-30.00 hrs, dt= 0.05 hrs

Reach 2R: (new Reach)



Time span=0.10-30.00 hrs, dt=0.05 hrs, 599 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 1S: PRE AREA G2 Runoff Area=118,578 sf 0.00% Impervious Runoff Depth=5.51"
Flow Length=88' Tc=6.0 min CN=75 Runoff=17.12 cfs 1.251 af

Subcatchment 2S: PRE AREA G3 SOUTH Runoff Area=164,152 sf 0.00% Impervious Runoff Depth=0.89"
Flow Length=205' Tc=13.5 min CN=34 Runoff=1.58 cfs 0.281 af

Reach 1R: (new Reach) Inflow=17.12 cfs 1.251 af
Outflow=17.12 cfs 1.251 af

Reach 2R: (new Reach) Inflow=1.58 cfs 0.281 af
Outflow=1.58 cfs 0.281 af

Total Runoff Area = 6.491 ac Runoff Volume = 1.532 af Average Runoff Depth = 2.83"
100.00% Pervious = 6.491 ac 0.00% Impervious = 0.000 ac

Summary for Subcatchment 1S: PRE AREA G2

3-INCH OD ROUND STEEL PANEL SUPPORTS. FOUR SUPPORTS PER PANEL TABLE.
IMPERVIOUS AREA PER PANEL TABLE IS 0.196 S.F.

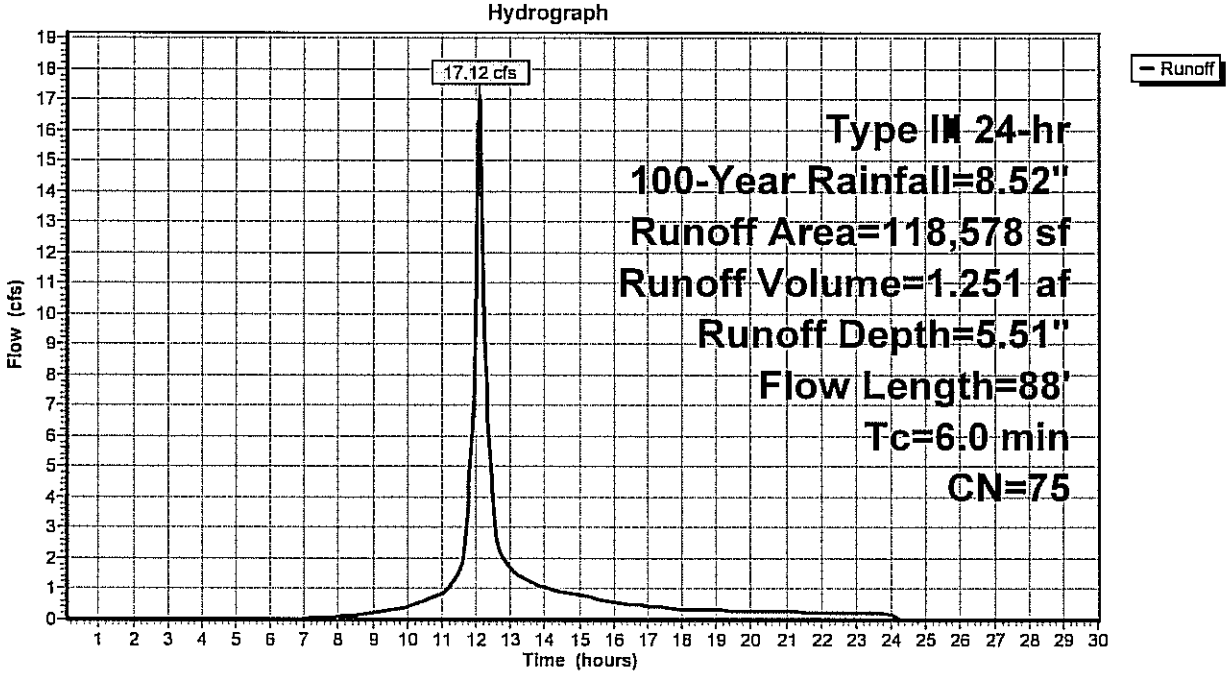
Runoff = 17.12 cfs @ 12.09 hrs, Volume= 1.251 af, Depth= 5.51"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.10-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=8.52"

Area (sf)	CN	Description
5,404	36	Woods, Fair, HSG A
113,174	77	Newly graded area, HSG A
118,578	75	Weighted Average
118,578		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.6	68	0.1600	2.00		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.5	20	0.0050	0.71		**Shallow Concentrated Flow,** Nearly Bare & Untilled Kv= 10.0 fps
4.9					**Direct Entry, add 4.9 to get 6 min**
6.0	88	Total			

Subcatchment 1S: PRE AREA G2



Summary for Subcatchment 2S: PRE AREA G3 SOUTH

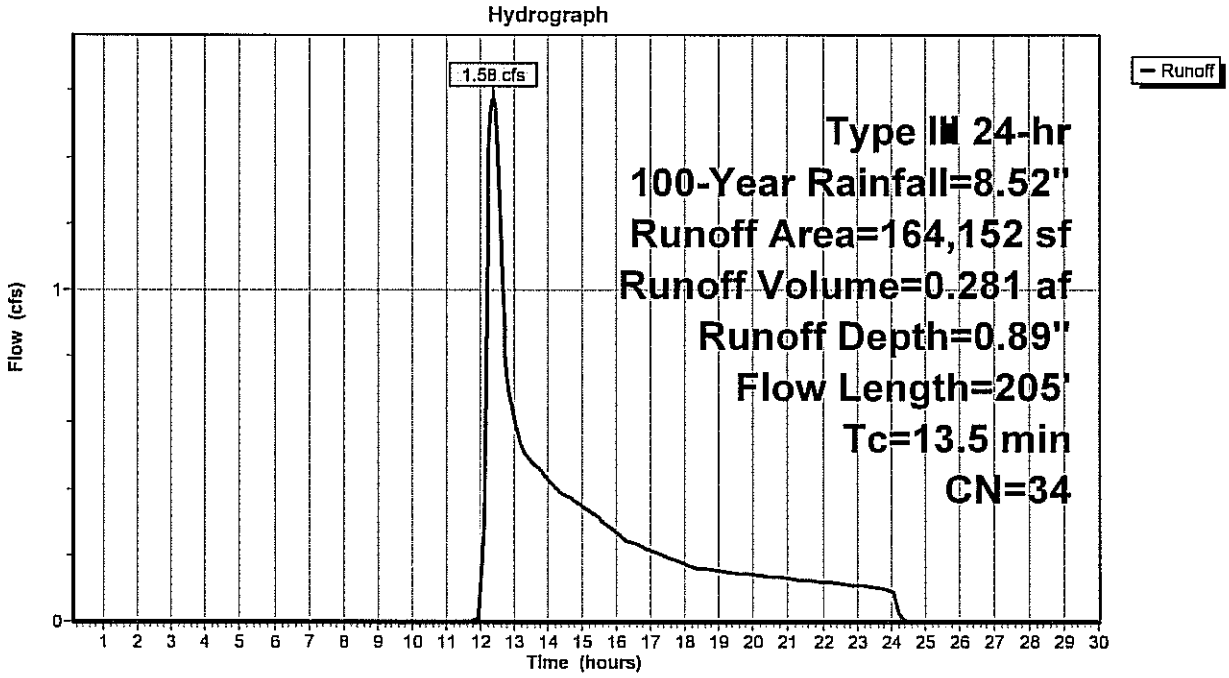
Runoff = 1.58 cfs @ 12.38 hrs, Volume= 0.281 af, Depth= 0.89"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.10-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=8.52"

Area (sf)	CN	Description
150,304	30	Woods, Good, HSG A
13,848	72	Dirt roads, HSG A
164,152	34	Weighted Average
164,152		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.9	20	0.0200	0.03		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.50"
0.9	55	0.0450	1.06		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.7	40	0.0380	0.97		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
2.0	90	0.0220	0.74		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
13.5	205	Total			

Subcatchment 2S: PRE AREA G3 SOUTH



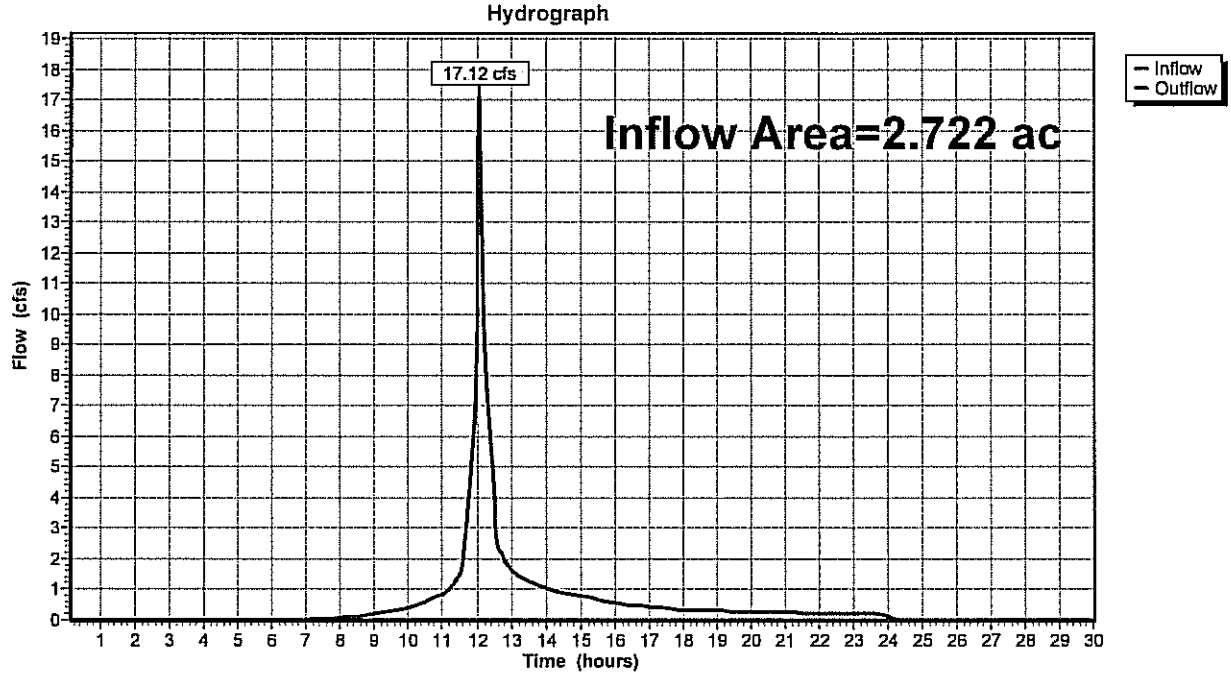
Summary for Reach 1R: (new Reach)

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 2.722 ac, 0.00% Impervious, Inflow Depth = 5.51" for 100-Year event
Inflow = 17.12 cfs @ 12.09 hrs, Volume= 1.251 af
Outflow = 17.12 cfs @ 12.09 hrs, Volume= 1.251 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.10-30.00 hrs, dt= 0.05 hrs

Reach 1R: (new Reach)



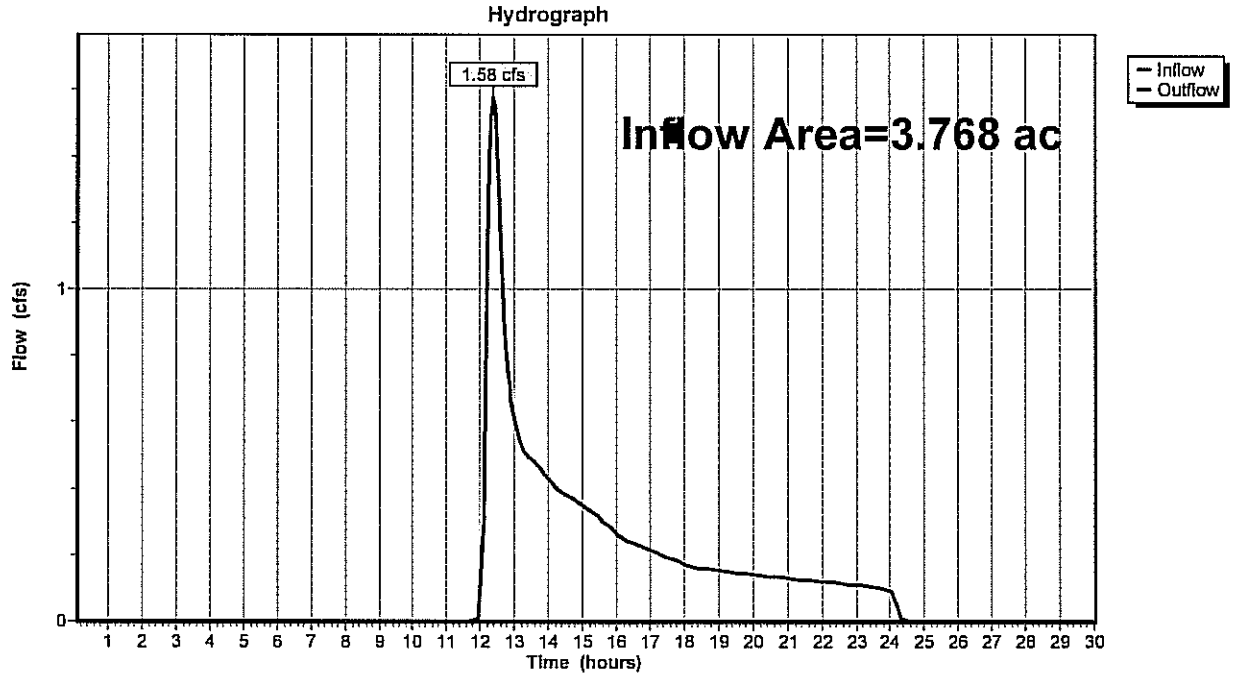
Summary for Reach 2R: (new Reach)

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 3.768 ac, 0.00% Impervious, Inflow Depth = 0.89" for 100-Year event
Inflow = 1.58 cfs @ 12.38 hrs, Volume= 0.281 af
Outflow = 1.58 cfs @ 12.38 hrs, Volume= 0.281 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.10-30.00 hrs, dt= 0.05 hrs

Reach 2R: (new Reach)



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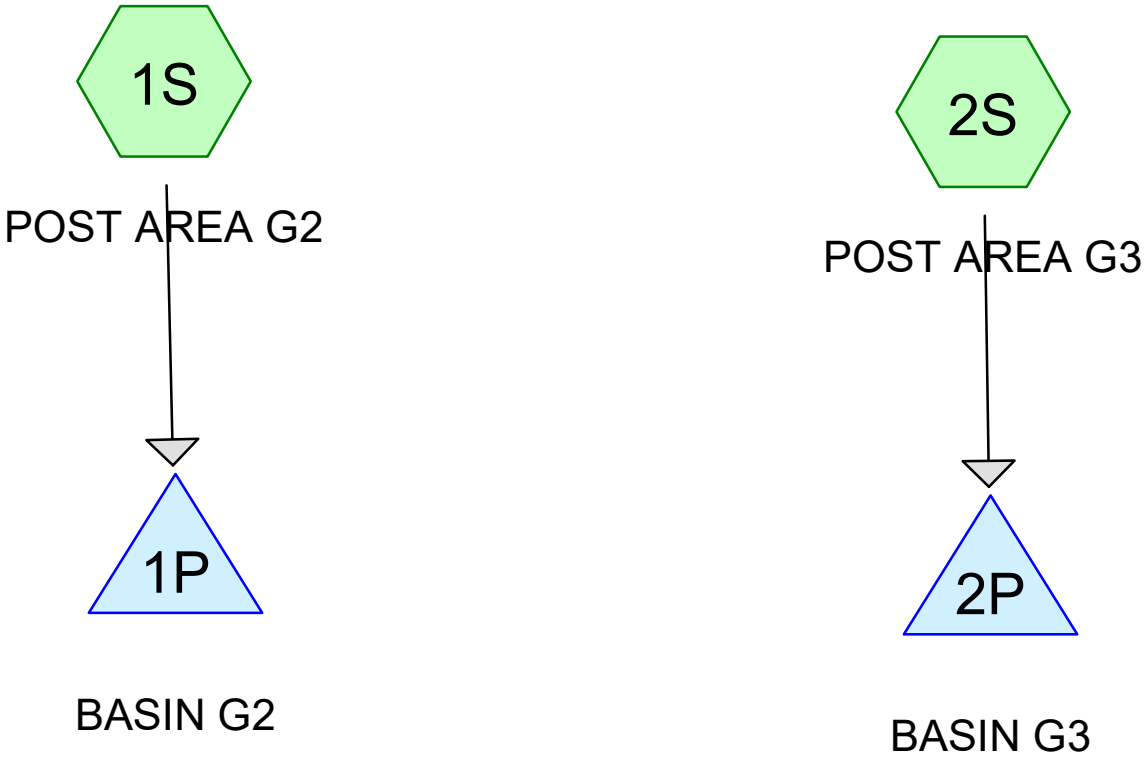
Current Messages

[13] Note: Time span=0.10-30.00 hrs, dt=0.05 hrs, 599 points
[16] Note: Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
[19] Note: Type III 24-hr 100-Year Rainfall=8.52"
[22] Note: Reach routing by Dyn-Stor-Ind method
[25] Note: Pond routing by Dyn-Stor-Ind method
[28] Note: Updating Subcat 1S: PRE AREA G2
[28] Note: Updating Subcat 2S: PRE AREA G3 SOUTH
[28] Note: Updating Reach 1R: (new Reach)
[40] Hint: Reach 1R Not Described (Outflow=Inflow)
[28] Note: Updating Reach 2R: (new Reach)
[40] Hint: Reach 2R Not Described (Outflow=Inflow)
[28] Note: Updating Text 10T: PV ARRAY AREA "G2"
[28] Note: Updating Text 14T: PV ARRAY AREA G3

Post Development Conditions Analysis Data
For Solar Farm
67 Chace Road (Map 241, Lot 36)
Freetown, MA

PV ARRAY AREA "G2"

PV ARRAY AREA "G3"



Subcat Reach Pond Link

Routing Diagram for POST CONDITIONS CHACE

Prepared by E. T. ENGINEERING ENT., INC., Printed 2/3/2022

Rainfall Events Listing

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	2-Year	Type III 24-hr		Default	24.00	1	3.31	2
2	10-Year	Type III 24-hr		Default	24.00	1	4.88	2
3	100-Year	Type III 24-hr		Default	24.00	1	8.52	2

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
5.837	39	>75% Grass cover, Good, HSG A (1S, 2S)
0.592	96	Gravel surface, HSG A (1S, 2S)
0.004	98	SOLAR SUPPORTS (1S, 2S)
0.057	98	TRANSFORMER PAD (1S, 2S)
6.491	**45**	**TOTAL AREA**

Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
6.429	HSG A	1S, 2S
0.000	HSG B	
0.000	HSG C	
0.000	HSG D	
0.062	Other	1S, 2S
6.491		**TOTAL AREA**

Ground Covers (all nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
5.837	0.000	0.000	0.000	0.000	5.837	>75% Grass cover, Good	1S, 2S
0.592	0.000	0.000	0.000	0.000	0.592	Gravel surface	1S, 2S
0.000	0.000	0.000	0.000	0.004	0.004	SOLAR SUPPORTS	1S, 2S
0.000	0.000	0.000	0.000	0.057	0.057	TRANSFORMER PAD	1S, 2S
6.429	**0.000**	**0.000**	**0.000**	**0.062**	**6.491**	**TOTAL AREA**	

Time span=0.10-36.00 hrs, dt=0.05 hrs, 719 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind method - Pond routing by Stor-Ind method

Subcatchment 1S: POST AREA G2 Runoff Area=118,578 sf 1.11% Impervious Runoff Depth=0.06"
Tc=6.0 min CN=45 Runoff=0.02 cfs 0.013 af

Subcatchment 2S: POST AREA G3 Runoff Area=164,152 sf 0.83% Impervious Runoff Depth=0.06"
Flow Length=160' Slope=0.0030 '/' Tc=11.8 min CN=45 Runoff=0.03 cfs 0.018 af

Pond 1P: BASIN G2 Peak Elev=90.50' Storage=7 cf Inflow=0.02 cfs 0.013 af
Discarded=0.02 cfs 0.013 af Primary=0.00 cfs 0.000 af Outflow=0.02 cfs 0.013 af

Pond 2P: BASIN G3 Peak Elev=94.20' Storage=6 cf Inflow=0.03 cfs 0.018 af
Discarded=0.03 cfs 0.018 af Primary=0.00 cfs 0.000 af Outflow=0.03 cfs 0.018 af

Total Runoff Area = 6.491 ac Runoff Volume = 0.031 af Average Runoff Depth = 0.06"
99.05% Pervious = 6.429 ac 0.95% Impervious = 0.062 ac

Summary for Subcatchment 1S: POST AREA G2

4-INCH OD ROUND STEEL PANEL SUPPORTS. EIGHT SUPPORTS PER PANEL TABLE.
IMPERVIOUS AREA PER PANEL TABLE IS 0.698 S.F.

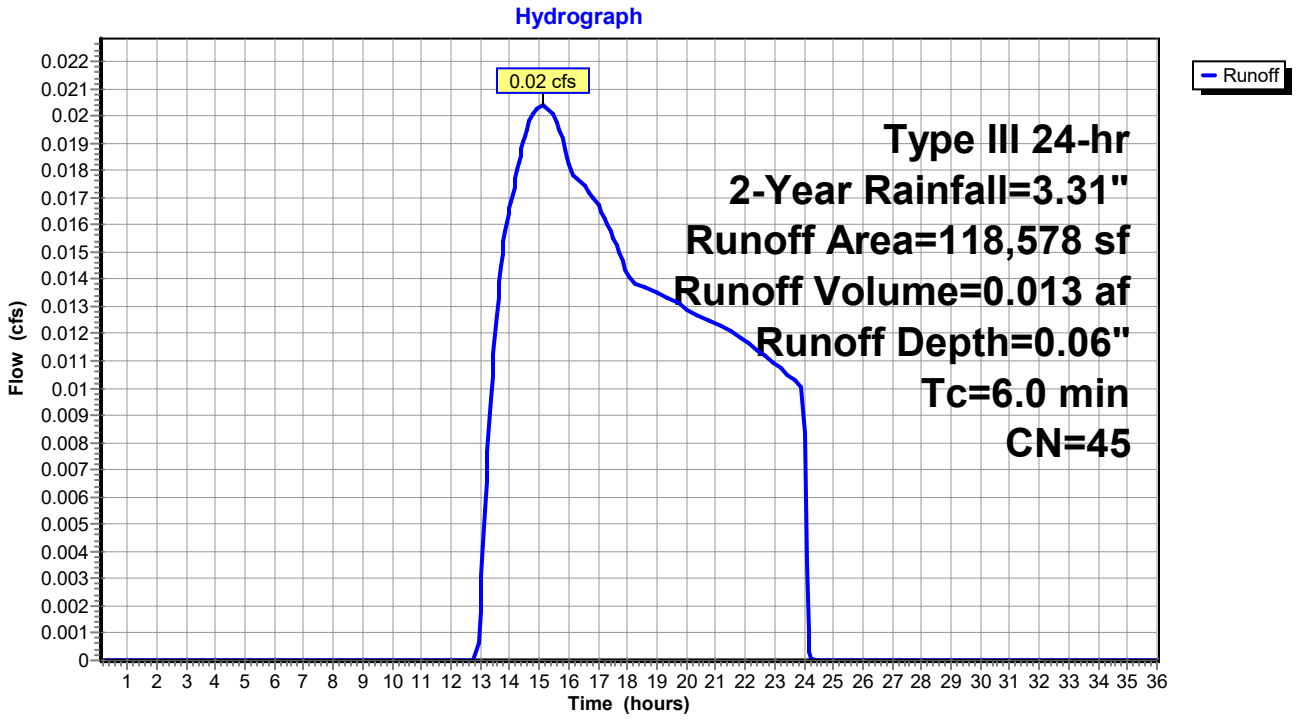
Runoff = 0.02 cfs @ 15.10 hrs, Volume= 0.013 af, Depth= 0.06"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.10-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.31"

	Area (sf)	CN	Description
	105,948	39	>75% Grass cover, Good, HSG A
*	70	98	SOLAR SUPPORTS
*	1,250	98	TRANSFORMER PAD
	11,310	96	Gravel surface, HSG A
	118,578	45	Weighted Average
	117,258		98.89% Pervious Area
	1,320		1.11% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Subcatchment 1S: POST AREA G2



Summary for Subcatchment 2S: POST AREA G3

4-INCH OD ROUND STEEL PANEL SUPPORTS. EIGHT SUPPORTS PER PANEL TABLE.
IMPERVIOUS AREA PER PANEL TABLE IS 0.698 S.F.

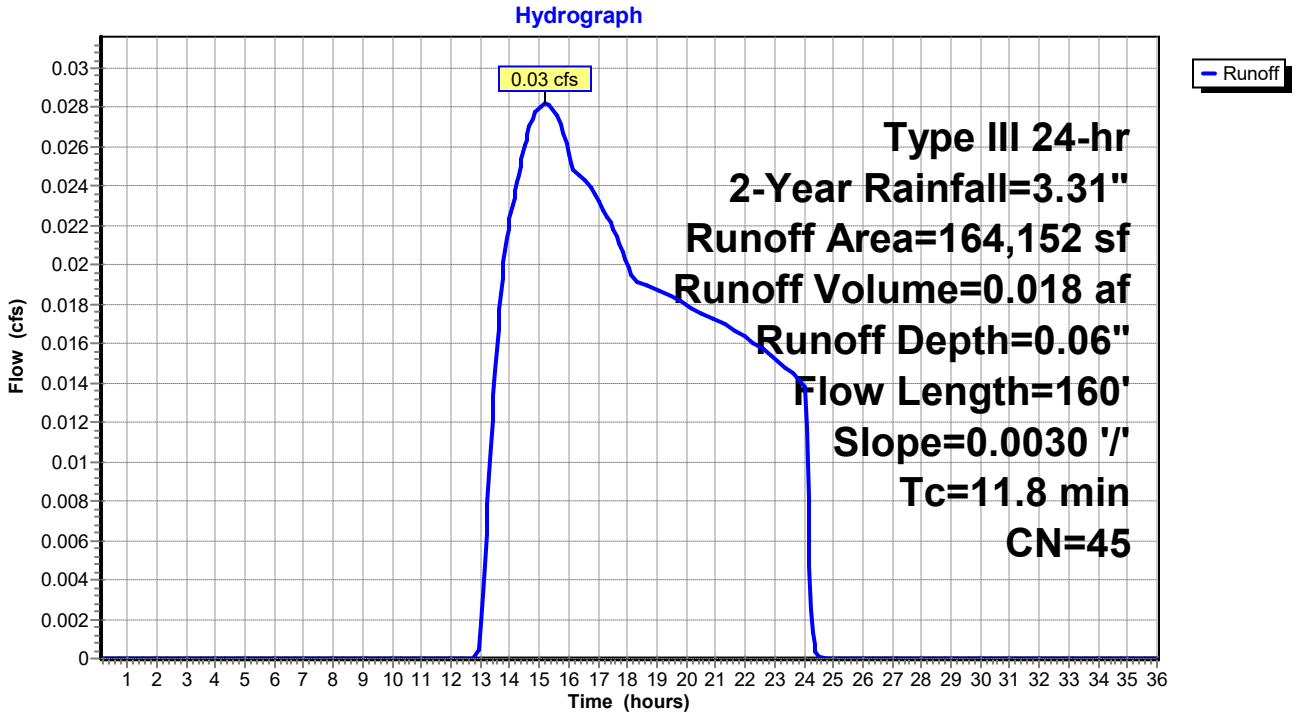
Runoff = 0.03 cfs @ 15.19 hrs, Volume= 0.018 af, Depth= 0.06"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.10-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.31"

	Area (sf)	CN	Description
	148,306	39	>75% Grass cover, Good, HSG A
*	116	98	SOLAR SUPPORTS
*	1,250	98	TRANSFORMER PAD
	14,480	96	Gravel surface, HSG A
	164,152	45	Weighted Average
	162,786		99.17% Pervious Area
	1,366		0.83% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.7	20	0.0030	0.06		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.31"
6.1	140	0.0030	0.38		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
11.8	160	Total			

Subcatchment 2S: POST AREA G3



Summary for Pond 1P: BASIN G2

Inflow Area = 2.722 ac, 1.11% Impervious, Inflow Depth = 0.06" for 2-Year event
Inflow = 0.02 cfs @ 15.10 hrs, Volume= 0.013 af
Outflow = 0.02 cfs @ 15.20 hrs, Volume= 0.013 af, Atten= 0%, Lag= 6.1 min
Discarded = 0.02 cfs @ 15.20 hrs, Volume= 0.013 af
Primary = 0.00 cfs @ 0.10 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.10-36.00 hrs, dt= 0.05 hrs
Peak Elev= 90.50' @ 15.20 hrs Surf.Area= 67,993 sf Storage= 7 cf

Plug-Flow detention time= 5.9 min calculated for 0.013 af (100% of inflow)
Center-of-Mass det. time= 5.9 min (1,091.9 - 1,086.0)

Volume	Invert	Avail.Storage	Storage Description
#1	90.50'	78,032 cf	**BASIN G2 (Irregular)** Listed below (Recalc)

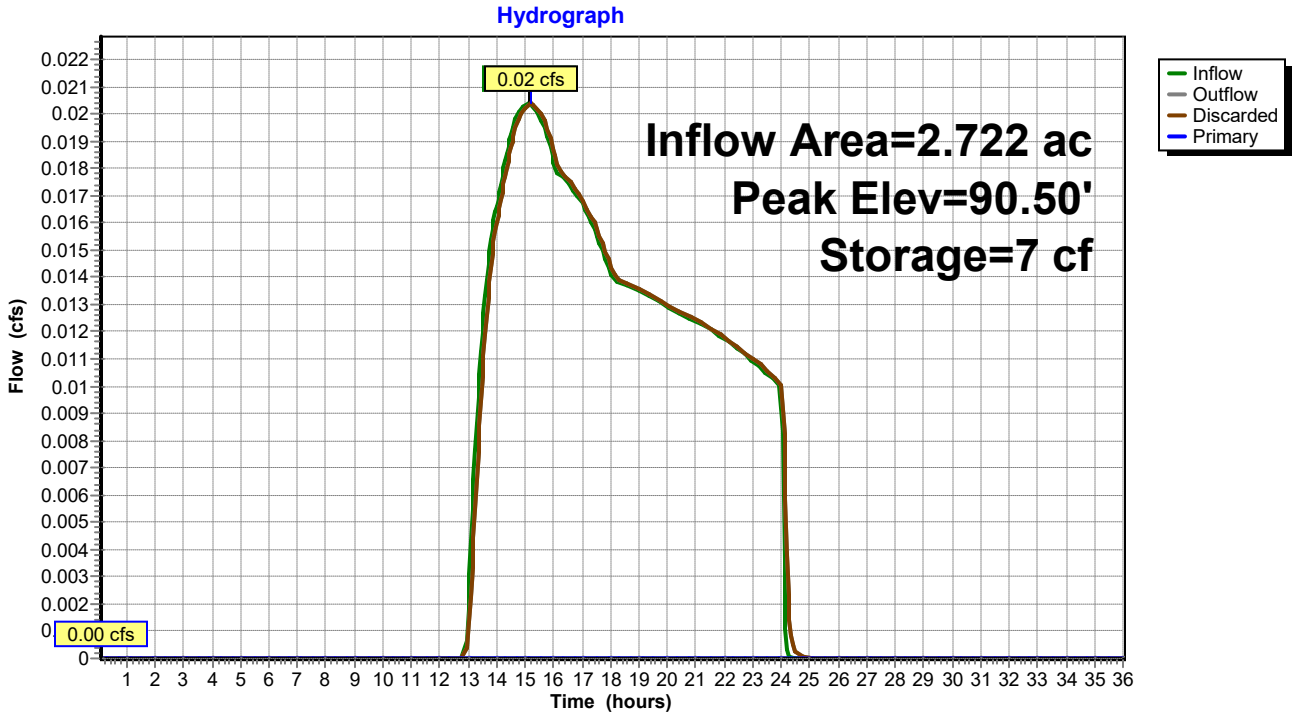
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
90.50	67,992	1,012.0	0	0	67,992
91.60	73,925	1,098.0	78,032	78,032	82,479

Device	Routing	Invert	Outlet Devices
#1	Discarded	90.50'	**2.410 in/hr Exfiltration over Surface area**
#2	Primary	91.49'	**12.0" Vert. Hypothetical Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=3.79 cfs @ 15.20 hrs HW=90.50' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 3.79 cfs)

Primary OutFlow Max=0.00 cfs @ 0.10 hrs HW=90.50' (Free Discharge)
↑—**2=Hypothetical Orifice/Grate** (Controls 0.00 cfs)

Pond 1P: BASIN G2



Summary for Pond 2P: BASIN G3

Inflow Area = 3.768 ac, 0.83% Impervious, Inflow Depth = 0.06" for 2-Year event
Inflow = 0.03 cfs @ 15.19 hrs, Volume= 0.018 af
Outflow = 0.03 cfs @ 15.25 hrs, Volume= 0.018 af, Atten= 0%, Lag= 3.6 min
Discarded = 0.03 cfs @ 15.25 hrs, Volume= 0.018 af
Primary = 0.00 cfs @ 0.10 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.10-36.00 hrs, dt= 0.05 hrs
Peak Elev= 94.20' @ 15.25 hrs Surf.Area= 37,598 sf Storage= 6 cf

Plug-Flow detention time= 3.6 min calculated for 0.018 af (100% of inflow)
Center-of-Mass det. time= 3.6 min (1,095.0 - 1,091.4)

Volume	Invert	Avail.Storage	Storage Description
#1	94.20'	51,418 cf	**BASIN G3 (Irregular)** Listed below (Recalc)

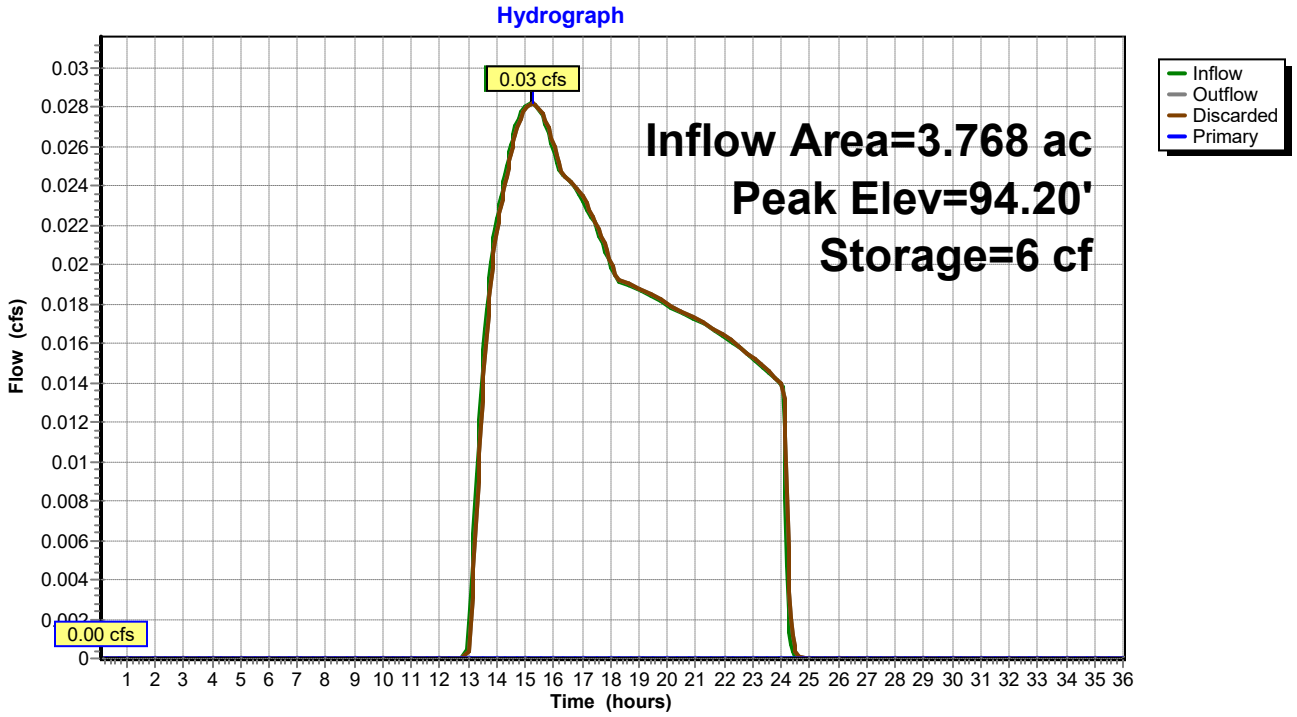
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
94.20	37,597	1,038.0	0	0	37,597
95.40	48,324	1,105.0	51,418	51,418	49,095

Device	Routing	Invert	Outlet Devices
#1	Discarded	94.20'	**2.410 in/hr Exfiltration over Surface area**
#2	Primary	94.99'	**12.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=2.10 cfs @ 15.25 hrs HW=94.20' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 2.10 cfs)

Primary OutFlow Max=0.00 cfs @ 0.10 hrs HW=94.20' (Free Discharge)
↑—**2=Orifice/Grate** (Controls 0.00 cfs)

Pond 2P: BASIN G3



Time span=0.10-36.00 hrs, dt=0.05 hrs, 719 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind method - Pond routing by Stor-Ind method

Subcatchment 1S: POST AREA G2 Runoff Area=118,578 sf 1.11% Impervious Runoff Depth=0.40"
Tc=6.0 min CN=45 Runoff=0.47 cfs 0.092 af

Subcatchment 2S: POST AREA G3 Runoff Area=164,152 sf 0.83% Impervious Runoff Depth=0.40"
Flow Length=160' Slope=0.0030 '/' Tc=11.8 min CN=45 Runoff=0.62 cfs 0.127 af

Pond 1P: BASIN G2 Peak Elev=90.50' Storage=154 cf Inflow=0.47 cfs 0.092 af
Discarded=0.43 cfs 0.092 af Primary=0.00 cfs 0.000 af Outflow=0.43 cfs 0.092 af

Pond 2P: BASIN G3 Peak Elev=94.20' Storage=129 cf Inflow=0.62 cfs 0.127 af
Discarded=0.60 cfs 0.127 af Primary=0.00 cfs 0.000 af Outflow=0.60 cfs 0.127 af

Total Runoff Area = 6.491 ac Runoff Volume = 0.219 af Average Runoff Depth = 0.40"
99.05% Pervious = 6.429 ac 0.95% Impervious = 0.062 ac

Summary for Subcatchment 1S: POST AREA G2

4-INCH OD ROUND STEEL PANEL SUPPORTS. EIGHT SUPPORTS PER PANEL TABLE.
IMPERVIOUS AREA PER PANEL TABLE IS 0.698 S.F.

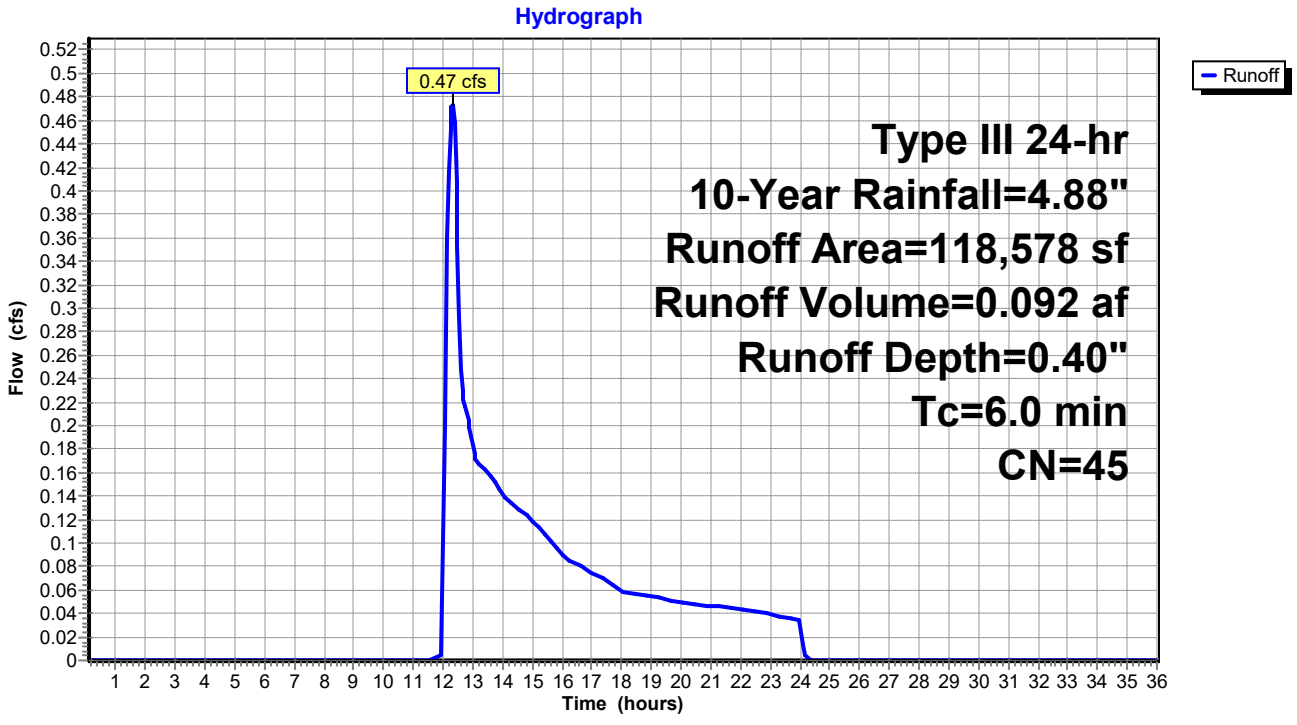
Runoff = 0.47 cfs @ 12.32 hrs, Volume= 0.092 af, Depth= 0.40"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.10-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.88"

	Area (sf)	CN	Description
	105,948	39	>75% Grass cover, Good, HSG A
*	70	98	SOLAR SUPPORTS
*	1,250	98	TRANSFORMER PAD
	11,310	96	Gravel surface, HSG A
	118,578	45	Weighted Average
	117,258		98.89% Pervious Area
	1,320		1.11% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Subcatchment 1S: POST AREA G2



Summary for Subcatchment 2S: POST AREA G3

4-INCH OD ROUND STEEL PANEL SUPPORTS. EIGHT SUPPORTS PER PANEL TABLE.
IMPERVIOUS AREA PER PANEL TABLE IS 0.698 S.F.

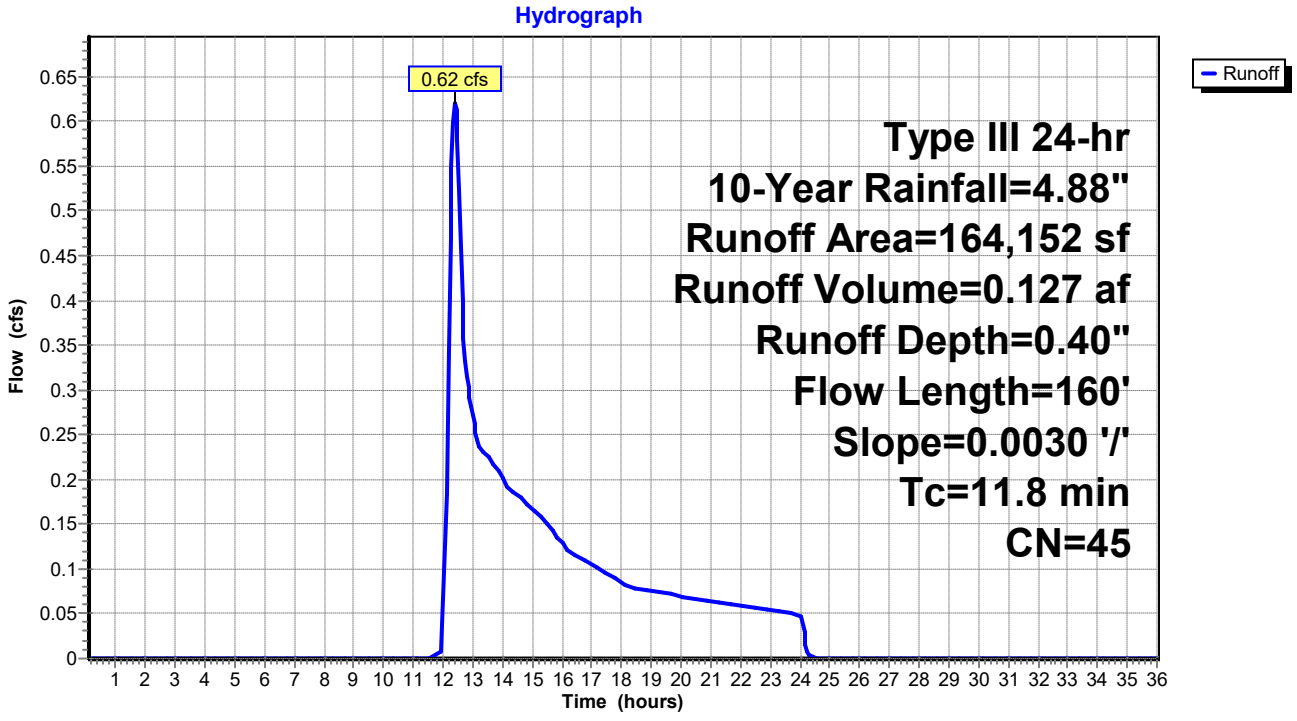
Runoff = 0.62 cfs @ 12.41 hrs, Volume= 0.127 af, Depth= 0.40"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.10-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.88"

	Area (sf)	CN	Description
	148,306	39	>75% Grass cover, Good, HSG A
*	116	98	SOLAR SUPPORTS
*	1,250	98	TRANSFORMER PAD
	14,480	96	Gravel surface, HSG A
	164,152	45	Weighted Average
	162,786		99.17% Pervious Area
	1,366		0.83% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.7	20	0.0030	0.06		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.31"
6.1	140	0.0030	0.38		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
11.8	160	Total			

Subcatchment 2S: POST AREA G3



Summary for Pond 1P: BASIN G2

Inflow Area = 2.722 ac, 1.11% Impervious, Inflow Depth = 0.40" for 10-Year event
Inflow = 0.47 cfs @ 12.32 hrs, Volume= 0.092 af
Outflow = 0.43 cfs @ 12.42 hrs, Volume= 0.092 af, Atten= 8%, Lag= 6.0 min
Discarded = 0.43 cfs @ 12.42 hrs, Volume= 0.092 af
Primary = 0.00 cfs @ 0.10 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.10-36.00 hrs, dt= 0.05 hrs
Peak Elev= 90.50' @ 12.42 hrs Surf.Area= 68,004 sf Storage= 154 cf

Plug-Flow detention time= 5.9 min calculated for 0.092 af (100% of inflow)
Center-of-Mass det. time= 5.9 min (957.1 - 951.1)

Volume	Invert	Avail.Storage	Storage Description
#1	90.50'	78,032 cf	**BASIN G2 (Irregular)** Listed below (Recalc)

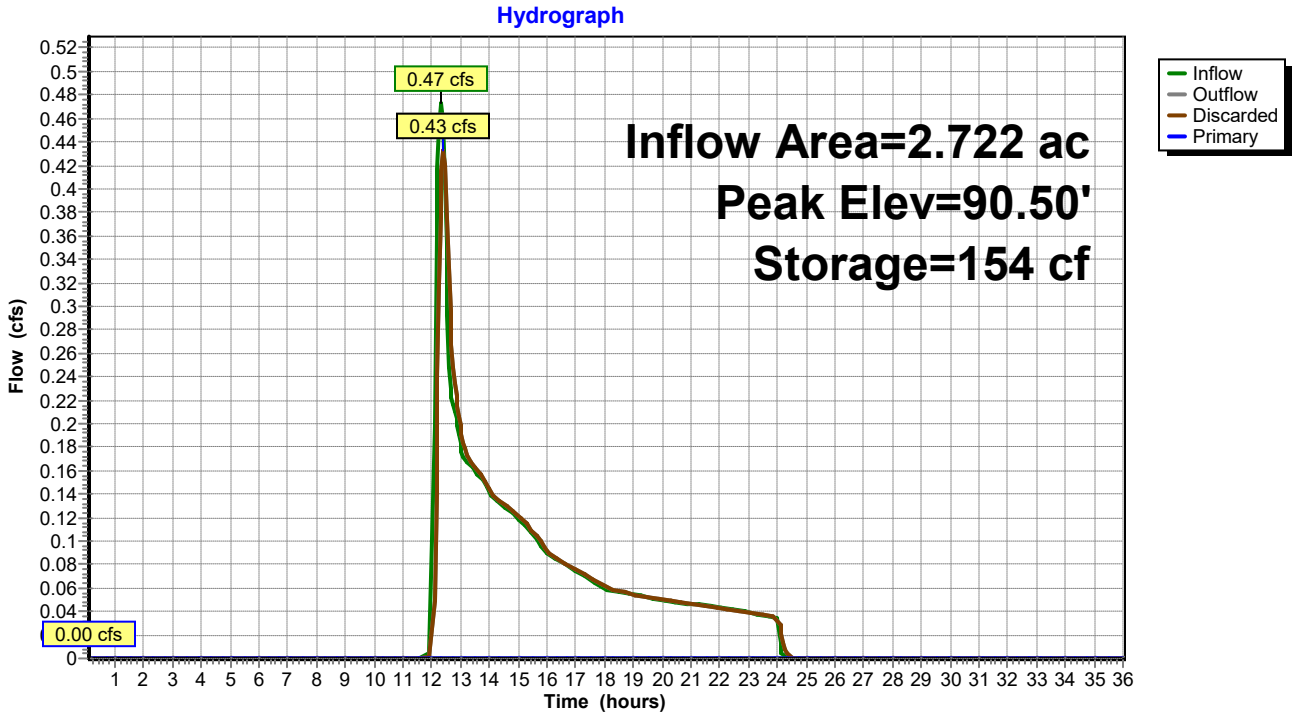
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
90.50	67,992	1,012.0	0	0	67,992
91.60	73,925	1,098.0	78,032	78,032	82,479

Device	Routing	Invert	Outlet Devices
#1	Discarded	90.50'	**2.410 in/hr Exfiltration over Surface area**
#2	Primary	91.49'	**12.0" Vert. Hypothetical Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=3.79 cfs @ 12.42 hrs HW=90.50' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 3.79 cfs)

Primary OutFlow Max=0.00 cfs @ 0.10 hrs HW=90.50' (Free Discharge)
↑—**2=Hypothetical Orifice/Grate** (Controls 0.00 cfs)

Pond 1P: BASIN G2



Summary for Pond 2P: BASIN G3

Inflow Area = 3.768 ac, 0.83% Impervious, Inflow Depth = 0.40" for 10-Year event
Inflow = 0.62 cfs @ 12.41 hrs, Volume= 0.127 af
Outflow = 0.60 cfs @ 12.47 hrs, Volume= 0.127 af, Atten= 3%, Lag= 3.7 min
Discarded = 0.60 cfs @ 12.47 hrs, Volume= 0.127 af
Primary = 0.00 cfs @ 0.10 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.10-36.00 hrs, dt= 0.05 hrs
Peak Elev= 94.20' @ 12.47 hrs Surf.Area= 37,626 sf Storage= 129 cf

Plug-Flow detention time= 3.6 min calculated for 0.127 af (100% of inflow)
Center-of-Mass det. time= 3.6 min (960.1 - 956.5)

Volume	Invert	Avail.Storage	Storage Description
#1	94.20'	51,418 cf	**BASIN G3 (Irregular)** Listed below (Recalc)

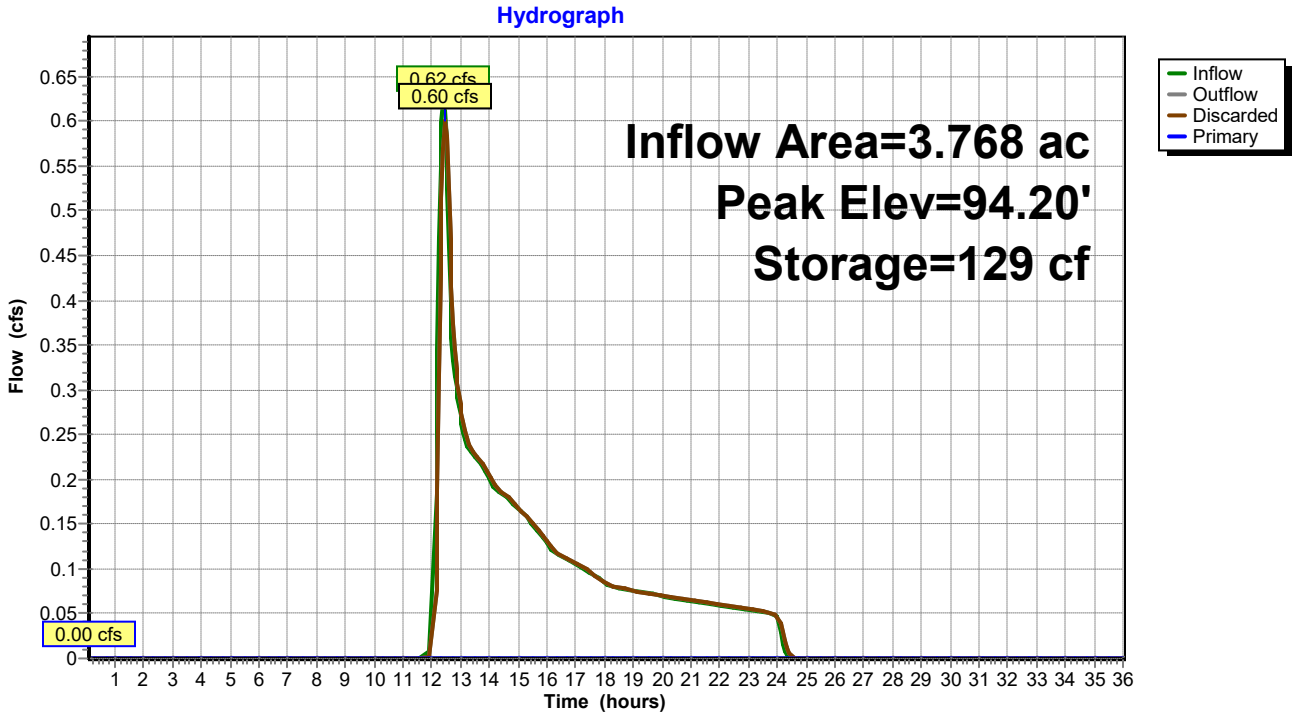
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
94.20	37,597	1,038.0	0	0	37,597
95.40	48,324	1,105.0	51,418	51,418	49,095

Device	Routing	Invert	Outlet Devices
#1	Discarded	94.20'	**2.410 in/hr Exfiltration over Surface area**
#2	Primary	94.99'	**12.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=2.10 cfs @ 12.47 hrs HW=94.20' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 2.10 cfs)

Primary OutFlow Max=0.00 cfs @ 0.10 hrs HW=94.20' (Free Discharge)
↑—**2=Orifice/Grate** (Controls 0.00 cfs)

Pond 2P: BASIN G3



Time span=0.10-36.00 hrs, dt=0.05 hrs, 719 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind method - Pond routing by Stor-Ind method

Subcatchment 1S: POST AREA G2 Runoff Area=118,578 sf 1.11% Impervious Runoff Depth=2.02"
Tc=6.0 min CN=45 Runoff=5.52 cfs 0.458 af

Subcatchment 2S: POST AREA G3 Runoff Area=164,152 sf 0.83% Impervious Runoff Depth=2.02"
Flow Length=160' Slope=0.0030 '/' Tc=11.8 min CN=45 Runoff=6.25 cfs 0.634 af

Pond 1P: BASIN G2 Peak Elev=90.52' Storage=1,579 cf Inflow=5.52 cfs 0.458 af
Discarded=3.80 cfs 0.458 af Primary=0.00 cfs 0.000 af Outflow=3.80 cfs 0.458 af

Pond 2P: BASIN G3 Peak Elev=94.33' Storage=5,105 cf Inflow=6.25 cfs 0.634 af
Discarded=2.16 cfs 0.634 af Primary=0.00 cfs 0.000 af Outflow=2.16 cfs 0.634 af

Total Runoff Area = 6.491 ac Runoff Volume = 1.091 af Average Runoff Depth = 2.02"
99.05% Pervious = 6.429 ac 0.95% Impervious = 0.062 ac

Summary for Subcatchment 1S: POST AREA G2

4-INCH OD ROUND STEEL PANEL SUPPORTS. EIGHT SUPPORTS PER PANEL TABLE.
IMPERVIOUS AREA PER PANEL TABLE IS 0.698 S.F.

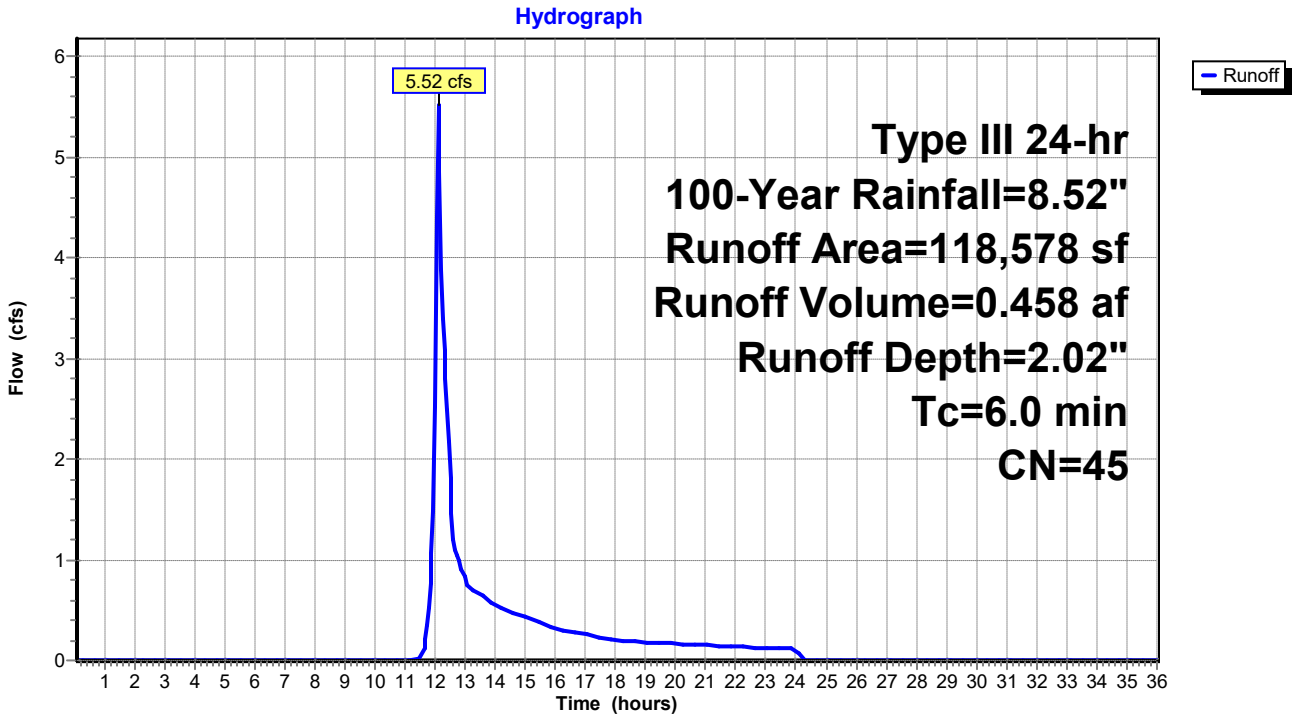
Runoff = 5.52 cfs @ 12.11 hrs, Volume= 0.458 af, Depth= 2.02"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.10-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=8.52"

	Area (sf)	CN	Description
	105,948	39	>75% Grass cover, Good, HSG A
*	70	98	SOLAR SUPPORTS
*	1,250	98	TRANSFORMER PAD
	11,310	96	Gravel surface, HSG A
	118,578	45	Weighted Average
	117,258		98.89% Pervious Area
	1,320		1.11% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Subcatchment 1S: POST AREA G2



Summary for Subcatchment 2S: POST AREA G3

4-INCH OD ROUND STEEL PANEL SUPPORTS. EIGHT SUPPORTS PER PANEL TABLE.
IMPERVIOUS AREA PER PANEL TABLE IS 0.698 S.F.

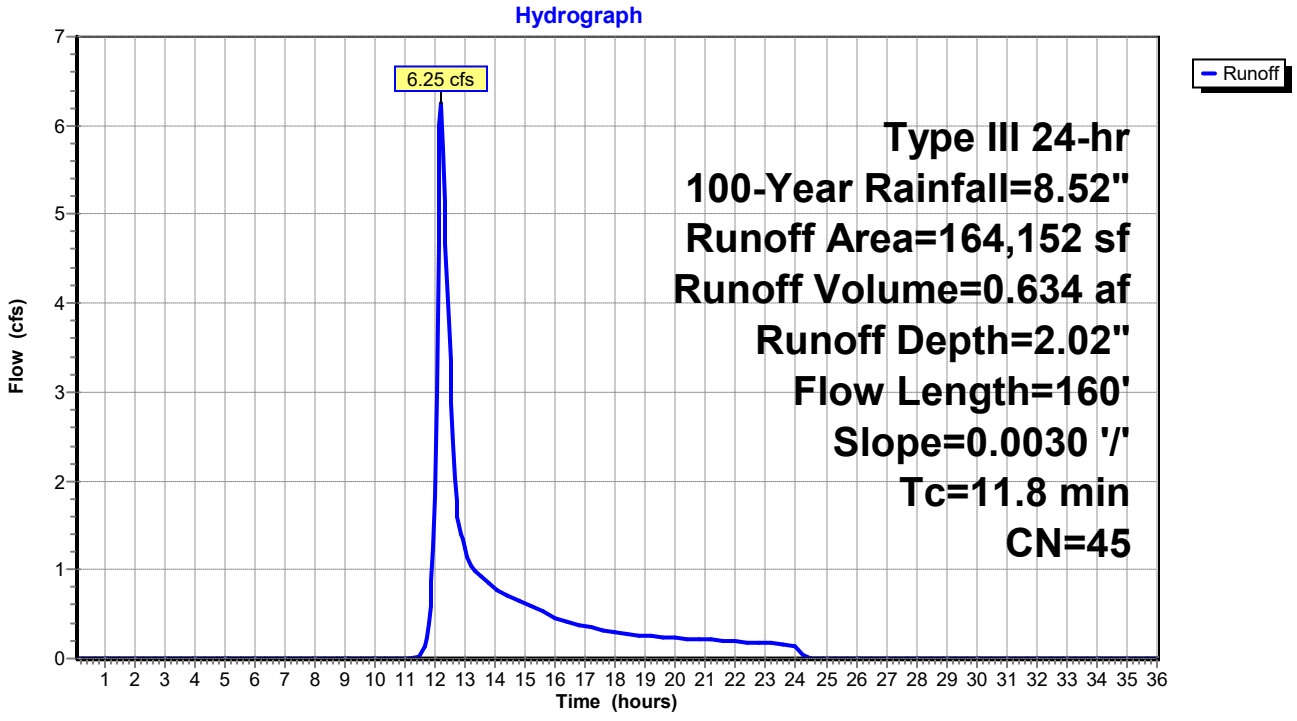
Runoff = 6.25 cfs @ 12.19 hrs, Volume= 0.634 af, Depth= 2.02"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.10-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=8.52"

	Area (sf)	CN	Description
	148,306	39	>75% Grass cover, Good, HSG A
*	116	98	SOLAR SUPPORTS
*	1,250	98	TRANSFORMER PAD
	14,480	96	Gravel surface, HSG A
	164,152	45	Weighted Average
	162,786		99.17% Pervious Area
	1,366		0.83% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.7	20	0.0030	0.06		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.31"
6.1	140	0.0030	0.38		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
11.8	160	Total			

Subcatchment 2S: POST AREA G3



Summary for Pond 1P: BASIN G2

Inflow Area = 2.722 ac, 1.11% Impervious, Inflow Depth = 2.02" for 100-Year event
Inflow = 5.52 cfs @ 12.11 hrs, Volume= 0.458 af
Outflow = 3.80 cfs @ 12.20 hrs, Volume= 0.458 af, Atten= 31%, Lag= 5.6 min
Discarded = 3.80 cfs @ 12.20 hrs, Volume= 0.458 af
Primary = 0.00 cfs @ 0.10 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.10-36.00 hrs, dt= 0.05 hrs
Peak Elev= 90.52' @ 12.21 hrs Surf.Area= 68,115 sf Storage= 1,579 cf

Plug-Flow detention time= 6.0 min calculated for 0.457 af (100% of inflow)
Center-of-Mass det. time= 6.0 min (887.1 - 881.1)

Volume	Invert	Avail.Storage	Storage Description
#1	90.50'	78,032 cf	**BASIN G2 (Irregular)** Listed below (Recalc)

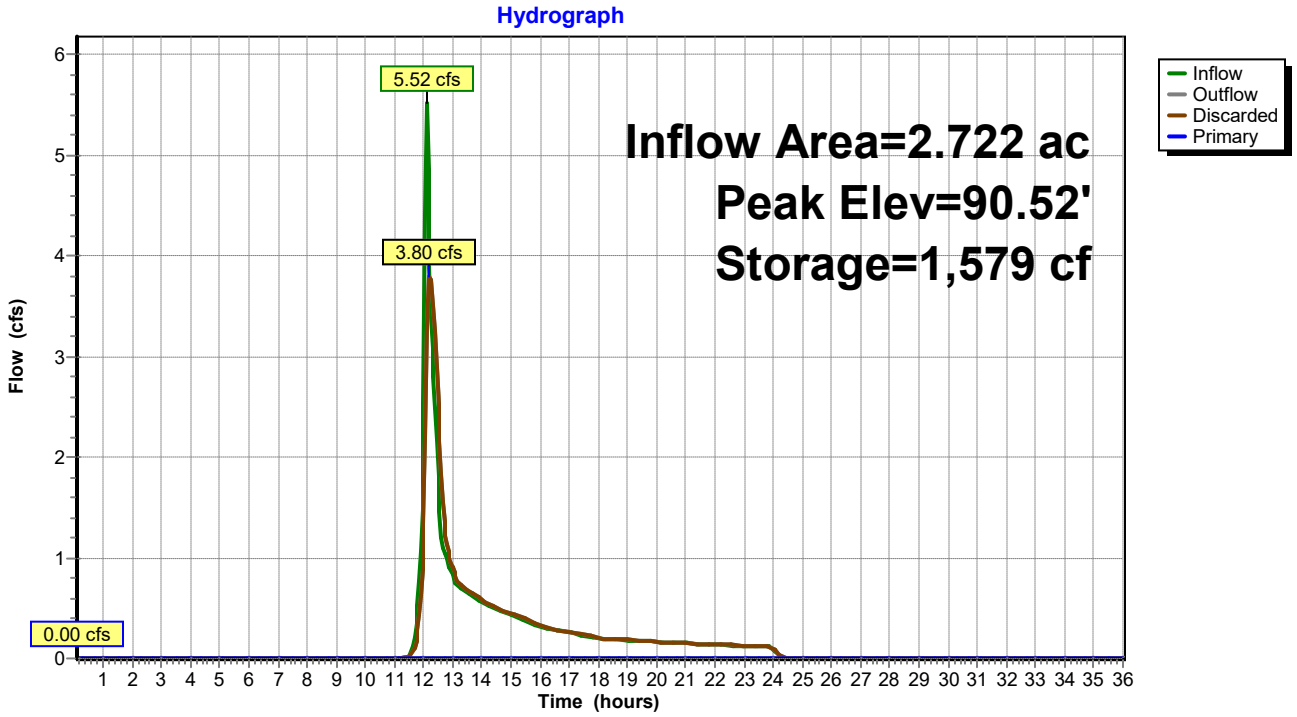
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
90.50	67,992	1,012.0	0	0	67,992
91.60	73,925	1,098.0	78,032	78,032	82,479

Device	Routing	Invert	Outlet Devices
#1	Discarded	90.50'	**2.410 in/hr Exfiltration over Surface area**
#2	Primary	91.49'	**12.0" Vert. Hypothetical Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=3.80 cfs @ 12.20 hrs HW=90.52' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 3.80 cfs)

Primary OutFlow Max=0.00 cfs @ 0.10 hrs HW=90.50' (Free Discharge)
↑—**2=Hypothetical Orifice/Grate** (Controls 0.00 cfs)

Pond 1P: BASIN G2



Summary for Pond 2P: BASIN G3

Inflow Area = 3.768 ac, 0.83% Impervious, Inflow Depth = 2.02" for 100-Year event
Inflow = 6.25 cfs @ 12.19 hrs, Volume= 0.634 af
Outflow = 2.16 cfs @ 12.64 hrs, Volume= 0.634 af, Atten= 65%, Lag= 26.6 min
Discarded = 2.16 cfs @ 12.64 hrs, Volume= 0.634 af
Primary = 0.00 cfs @ 0.10 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.10-36.00 hrs, dt= 0.05 hrs
Peak Elev= 94.33' @ 12.64 hrs Surf.Area= 38,726 sf Storage= 5,105 cf

Plug-Flow detention time= 14.6 min calculated for 0.633 af (100% of inflow)
Center-of-Mass det. time= 14.6 min (901.1 - 886.5)

Volume	Invert	Avail.Storage	Storage Description
#1	94.20'	51,418 cf	**BASIN G3 (Irregular)** Listed below (Recalc)

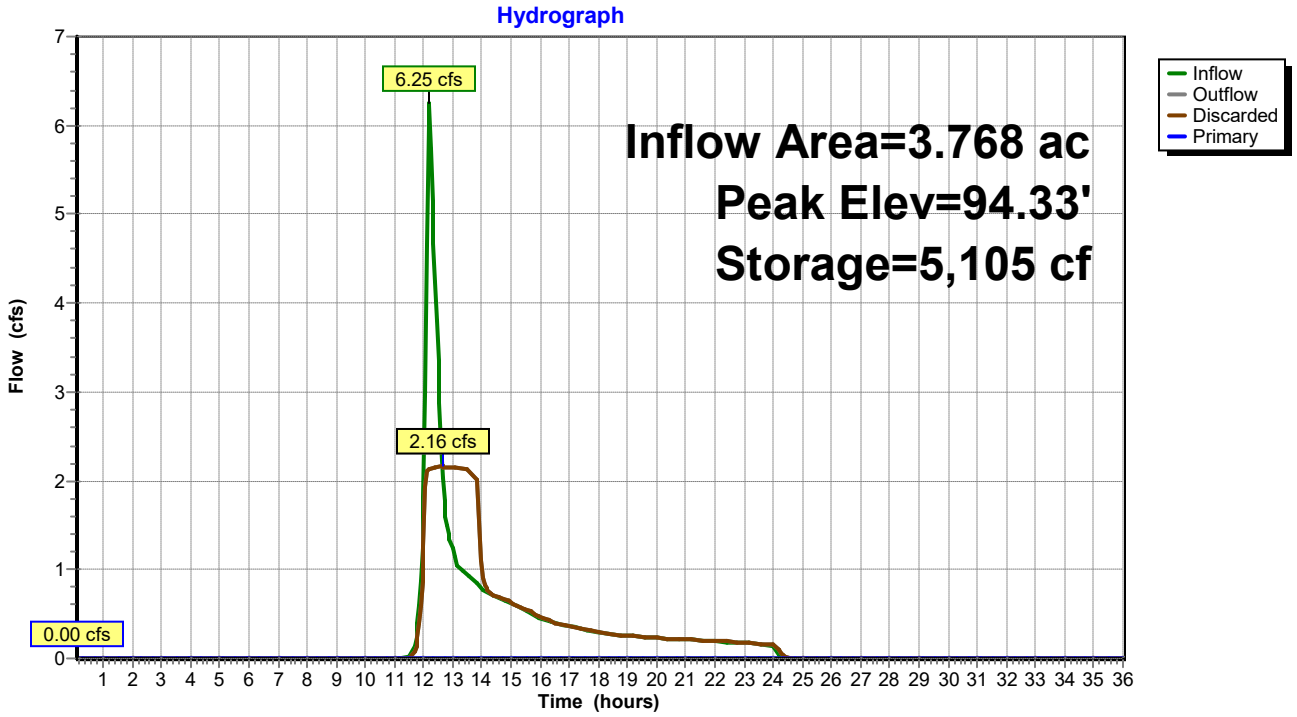
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
94.20	37,597	1,038.0	0	0	37,597
95.40	48,324	1,105.0	51,418	51,418	49,095

Device	Routing	Invert	Outlet Devices
#1	Discarded	94.20'	**2.410 in/hr Exfiltration over Surface area**
#2	Primary	94.99'	**12.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=2.16 cfs @ 12.64 hrs HW=94.33' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 2.16 cfs)

Primary OutFlow Max=0.00 cfs @ 0.10 hrs HW=94.20' (Free Discharge)
↑—**2=Orifice/Grate** (Controls 0.00 cfs)

Pond 2P: BASIN G3



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Current Messages

[13] Note: Time span=0.10-36.00 hrs, dt=0.05 hrs, 719 points
[16] Note: Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
[19] Note: Type III 24-hr 10-Year Rainfall=4.88"
[22] Note: Reach routing by Stor-Ind method
[25] Note: Pond routing by Stor-Ind method
[28] Note: Updating Subcat 14S: POST AREA G2
[28] Note: Updating Subcat 34S: POST AREA G3
[28] Note: Updating Pond 5P: BASIN G2
[28] Note: Updating Pond 35P: BASIN G3
[28] Note: Updating Text 11T: PV ARRAY AREA "G2"
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Current Messages

[13] Note: Time span=0.10-36.00 hrs, dt=0.05 hrs, 719 points
[16] Note: Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
[19] Note: Type III 24-hr 100-Year Rainfall=8.52"
[22] Note: Reach routing by Stor-Ind method
[25] Note: Pond routing by Stor-Ind method
[28] Note: Updating Subcat 14S: POST AREA G2
[28] Note: Updating Subcat 34S: POST AREA G3
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[28] Note: Updating Text 13T: PV ARRAY AREA "G3"